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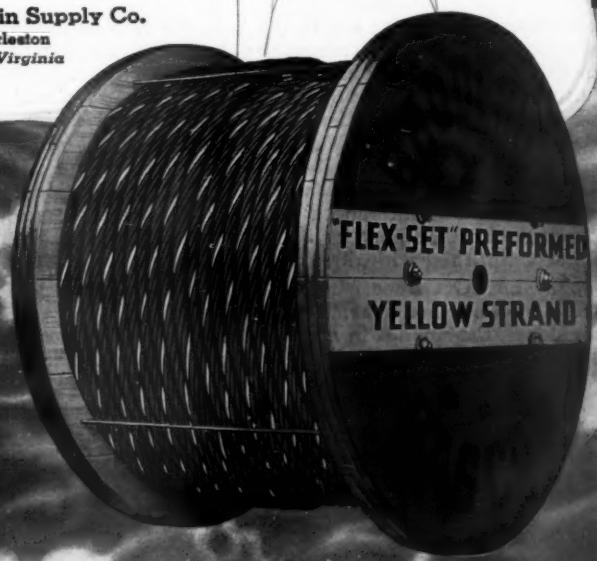

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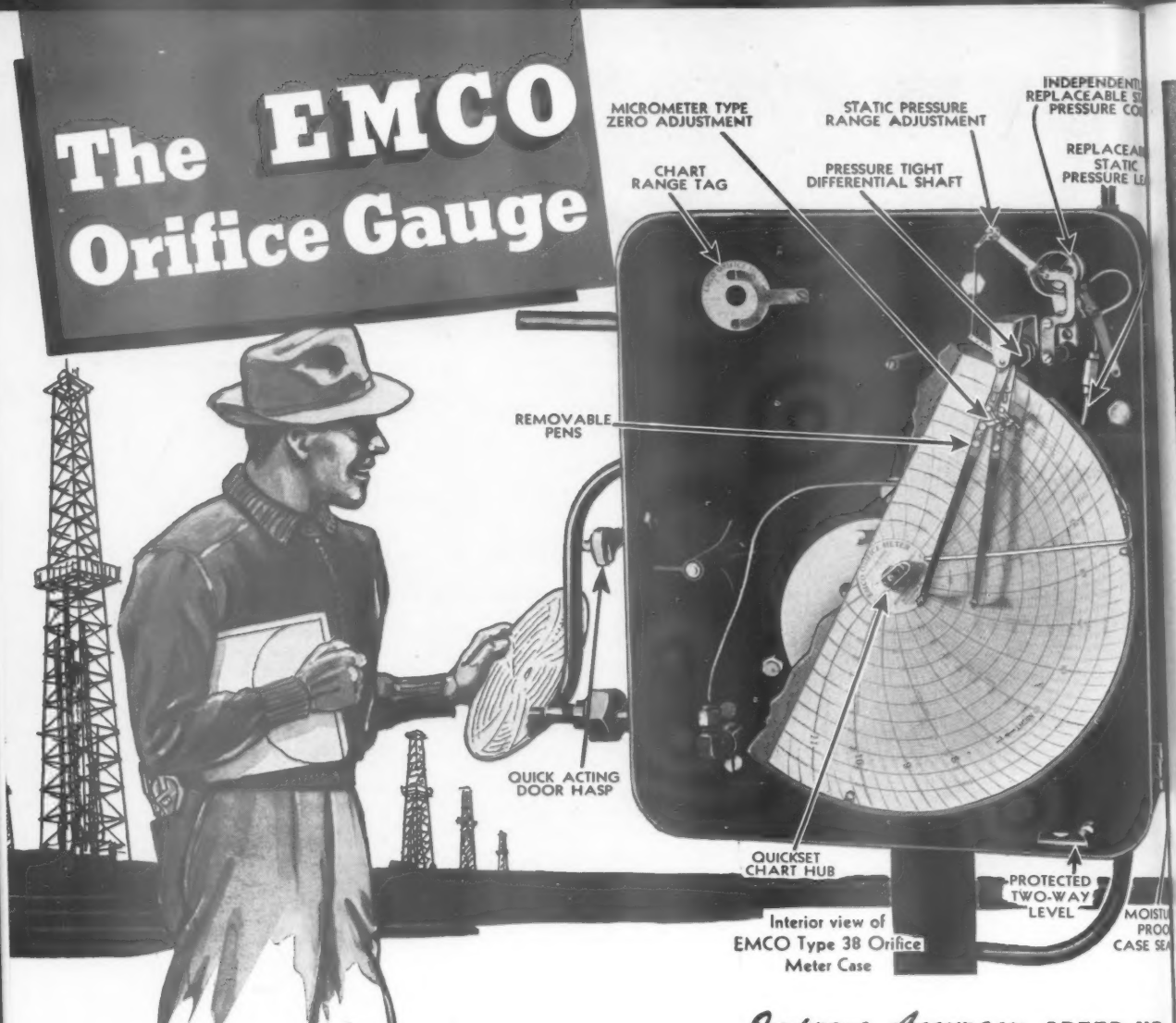

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Table of Contents

NEWS DEVELOPMENTS

Replacement Cost Ignored in OPA Crude-Price Survey 40
Revised Pact Sent to President's Committee 40
Industry Warned About Manpower Urgency 40
Exploratory Play Focuses Attention on Rocky Mountains... 41
Rocky Mountain Association Offices Established in Casper... 44
Hill Becomes Officer of Petroleum Advisers, Inc. 44
Venezuela Sets New Record in Crude-Oil Production 46
Four Cities Service Men Promoted 46
Heath's 25th Anniversary Celebrated by Pure Oil 48
PAW March Production Rates in Barrels Per Calendar Day.. 48

Trends 39
This Week 43
Editorial 45
Deaths in the Industry ... 48
Natural-Gas News 90
Natural-Gasoline News ... 90
Refining News 95
Pipe-Line News 98

ENGINEERING AND OPERATING

Power-Driven Rotary Slips Operate Successfully 50
Reconditioning Shell Company's Tonkawa-Cushing Lines... 52
Multistage Weathering of Saturated Absorption Oil 57
Pump Removes Collector-Settler Tank Sediment 61
New Products Developed From Natural Gas 63
Resaturate While Repressuring—A Wartime Suggestion 67
Mechanics of Production Series — No. 19 — Applications of Darcy's Law 71
Questions on Technology 78

Plant Practices 76
Eng. Fundamentals 81
The Refiner's Notebook .. 83
Journalog 85

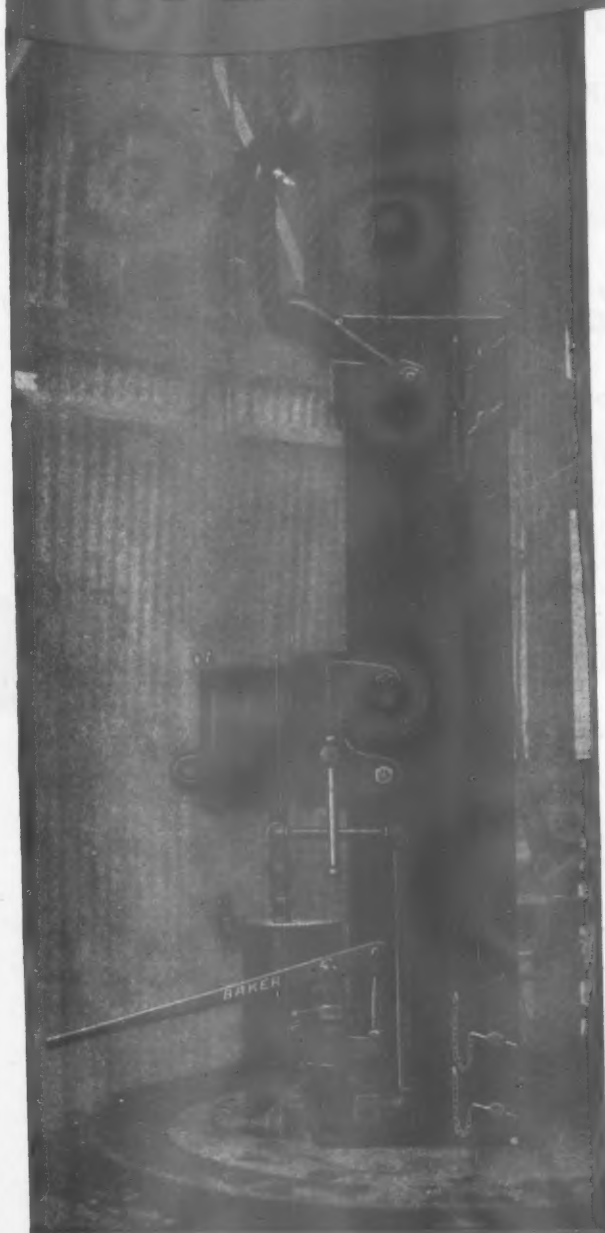
EXPLORATION AND DRILLING

Week's Highlights 101
Completions in All Fields 101
Daily Average Production for Week 102
Reports by Areas Start on Page 102
Wildcat Completions and Discoveries 111

ADDITIONAL FEATURES

Drilling Contractors 112
Market Summary 113
Crude-Oil Prices 113
Personals 114
Events on the Calendar... 115
Equipment Men in News. 117
Classified Advertising ... 118
Advertisers' Index 120

AN IMPORTANT ANNOUNCEMENT
to a LIMITED NUMBER of Operators



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Trends

Crude-Oil Production
By States—Page 102

CRUDE-OIL STOCKS 219,351,000 bbl. as of Feb. 24—down 709,000 bbl. One year ago 237,137,000 bbl.

GASOLINE STOCKS 95,972,000 bbl. as of Feb. 24—up 1,292,000 bbl. One year ago 84,392,000 bbl.

RESIDUAL FUEL-OIL STOCKS 46,723,000 bbl. as of Feb. 24—down 1,517,000 bbl. One year ago 51,879,000 bbl.

GAS OIL AND DISTILLATE STOCKS 28,753,000 bbl. as of Feb. 24—down 1,111,000 bbl. One year ago 33,889,000 bbl.

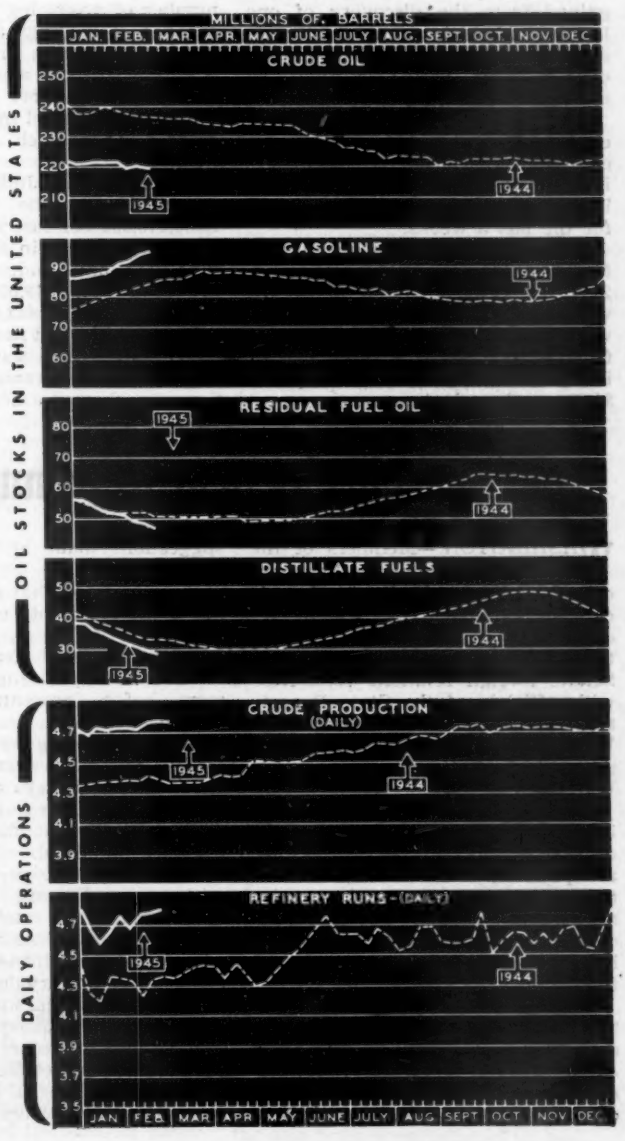
CRUDE OIL PRODUCTION 4,763,700 bbl. as of Mar. 3—down 13,550 bbl. One year ago 4,399,800 bbl.

REFINERY RUNS 4,803,000 bbl. daily week ended Feb. 24—up 16,000 bbl. One year ago 4,421,000 bbl.

ANNOUNCEMENTS over the past 2 weeks indicate predictions that 1945 would witness a substantial increase in cooperative operations within the petroleum industry will materialize. A start has been made in Texas with the purchase of a refinery near Amarillo. It is stated that plans have been perfected for widespread refining and marketing operations in that state under the direction of an organization already well established in the Middle West. This program is under way despite the fact that the Texas Attorney General has held that petroleum co-ops cannot operate in the state. The co-ops now have 11 plants located in Illinois, Kansas, Nebraska, Oklahoma, Texas and Montana, with a rated crude-oil capacity of approximately 70,000 bbl. daily. These associations with additional plants expect to be refining in excess of 100,000 bbl. of crude oil daily before January 1, 1946.

THE principal cooperative associations have also stated at their annual meetings that they are interested in the purchase of crude-oil production and pipe-line facilities. In Kansas, where four cooperative refineries are located, approximately 1,000 bbl. daily of additional crude-oil production was recently purchased. It is said that top officials of the co-ops realize that the lack of association-owned crude-oil supplies is their greatest weakness and one that is most difficult to remedy. Those familiar with operating conditions in the Southwest and Middle West point out that when the emergency program of allocating crude-oil supplies is ended some of the co-op plants will be among those with insufficient crude oil.

ECONOMISTS feel that this situation may have political repercussions and result in demands at Washington that the war program of distributing crude-oil supplies be continued indefinitely. Such a plan, if seriously suggested, is certain to have strong opposition from large and small refining organizations which feel that the co-ops are not entitled to special consideration when it comes time to return to prewar competitive conditions. They contend that their own permanent position in the petroleum industry has suffered over the past 3 years because they have had to sacrifice crude-oil reserves and properties built up over a period of many years, in order to assist in maintaining operating efficiency of all refining units during the war period.



Replacement Cost Ignored in OPA Crude-Oil Price Survey

WASHINGTON.—Replacement cost—the factor upon which the oil producer has especially based his hopes for higher crude prices—is being ignored by Office of Price Administration in its current study of crude-oil prices. Industry profit is the basis upon which OPA is determining its ceilings. No trustworthy figures concerning replacement costs are obtainable, it is asserted in explanation of the course adopted.

The cost of finding oil is affected by new discoveries, according to Orville Judd, associate director of OPA's fuel price division. Benefits gained from the discovery of one large pool which might greatly reduce costs could not be evaluated over a short period of time, he added.

Judd said all known costs, such as exploration, amortization and depreciation, were considered in preparing the questionnaire which has been in the hands of the industry for the last 3 weeks.

In addition, Judd said, both actual finding costs for past years and a 27½ per cent depletion allowance were being granted the industry, which has received a price increase from an average of $1.14 per barrel in October 1941 to an average of $1.22 per barrel at present.

The OPA associate director said the agency's policy always had been to base price ceilings on the profits of an industry, and that increases would be granted in any case where net profits are not equal to those of a normal period.

He pointed out that machinery already was set up to adjust prices to changed conditions at any time, and explained that the cost survey was being made in four parts to take care of any class which might need a price increase, although OPA was not required by law to do so.

Judd said petroleum reserves, the number of producing wells, and the number of drillings all showed increases, and while production costs admittedly had increased, he thought these had been more than offset by the 8-cents-a-barrel increase already granted and much lower selling costs.

As an example, Judd cited figures which showed the industry sold 1,680,148,000 bbl. last year, compared with 1,380,000,000 in the best peacetime year, and producing wells had increased from 349,000 in the best peacetime year to 412,851 in 1944.

Judd said he did not think a price increase at present was justified, but that it would be granted if the questionnaire showed a need for it.

Revised Pact Is Sent to Committee

WASHINGTON.—Members of the president's committee have received copies of the British-American oil agreement revised in accordance with suggestions made at the conference February 22 of the Senate foreign relations committee with officials of the State Department, Petroleum Administration for War, and the national oil policy committee of Petroleum Industry War Council.

Although provisions of the pact in its revised form have not been disclosed, as changes in the wording are possible, it is understood that the proposed international commission would have only power to recommend and its suggestions would have to be ratified by the two participating governments.

The agreement was submitted to the State, Interior, War and Navy departments, the Foreign Economic Administration and PAW following a meeting February 27 of the president's committee, which considered suggestions made at the February 22 conference.

It is expected that another meeting of the president's committee will be called, following consideration by the interested departments, to consider final phrasing of the document before presentation to the British.

Another meeting with the Senate foreign relations committee will be called if the changes are extensive, although PAW has indicated the redrafted agreement meets with its complete approval.

Members of the president's committee are: Edward R. Stettinius, Jr., secretary of state, chairman; Harold L. Ickes, secretary of the interior, vice chairman; James V. Forrestal, secretary of the Navy; Robert P. Patterson, under secretary of war; Leo T. Crowley, foreign economic administrator; Ralph K. Davies, deputy petroleum administrator, and Charles B. Rayner, State Department petroleum adviser.

Industry Warned About Manpower Urgency

Significance of more stringent regulations in selective service deferment policies permeated through the petroleum industry this week. Probable induction of all but a small percentage of key men between 18 and 29 in most essential petroleum work confronted the industry with its most critical manpower problem since the war.

Most of the large companies, a spot check this week disclosed, have already completed or are well advanced in compliance with instructions from the Petroleum Administration for War on proper procedure for deferring key men. There was danger that some of the smaller companies and independent operators would find the entire industry-deferment quota filled before their questionnaires on manpower are returned to PAW.

In order to advise individually as many operators as possible in all classifications, trade associations last week completed service of mailing copies of procedure instructions to their members. The associations transmitted complete forms and full instructions to their members, speeding up the process of informing as many operators as possible in the shortest time so that all could have equal opportunity in retaining essential men.

The new PAW manpower questionnaire, warned Ralph K. Davies, deputy petroleum administrator, should be returned immediately to the PAW Manpower Counselor, New Interior Building, Washington 25, D. C., by every affected employer. Regardless of other requests for information on status of manpower, the current form should be filled out and mailed without delay. Copies of the procedure and forms are available through trade associations, regional PAW offices or direct from Washington.

Ashland Acquires Texaco Properties in Kentucky

NEW YORK.—Properties of The Texas Co. in eastern Kentucky, comprising the production and pipe-line system in Lee, Estill and Powell counties, and a refinery at Pryse, have been purchased by Ashland Oil & Refining Co., Ashland, Ky. The refinery has a daily crude-oil capacity of 5,000 bbl., capable of producing 2,000 bbl. of cracked gasoline daily, and is equipped for manufacture of kerosene, gas oil and fuel oil.

Ashland has a refinery at Catlettsburg, Ky., with a daily crude capacity of 20,000 bbl., and can manufacture 4,200 bbl. of cracked gasoline daily, in addition to other products, including asphalt.

Vigorous Exploratory Play Focuses Attention on Rocky Mountain Area

by Charles J. Deegan

THE Rocky Mountain region currently is the scene of one of the most active exploration plays in its history, and is attracting more and more attention from oil men in all parts of the country. The reason for this interest is normal, successes in finding oil. In 1942 there were six new fields or new pays found and three extensions to old fields; in 1943 there were eight new fields or new pays, and eight extensions; in 1944 there were 24 new fields or new pays found and seven extensions to old fields.

The number of geologists stationed in the Rocky Mountain area is estimated to have multiplied by five since 1941. The number of geophysical crews operating in the region increased from 15 in 1941, to 22 in 1942, to 34 in 1943, and to about 70 in 1944. Leasing activity, as might be expected from these figures, has increased by leaps and bounds, with very active trading.

In spite of all this interest, the veteran operators and geologists of the region take a restrained position on future prospects. Having seen booms come and go before this, they make a fairly good case. Their restraint is because practically every one of the new finds is on a surface structure that has been mapped and known for 20 years or more; that most of the new oil is black crude, fairly low in gravity, high in sulfur, and low in price.

Surface structures dot the landscape and most of them have been mapped and reports published on them. A great many of these structures have been tested during the past 20 years at various times to varying depths. Periodically a substantial strike has been made in a deeper pay on some structure, and this has then set off a new wave of deeper drilling on many of the older structures to test the new pay. Since improvements in drilling equipment have come gradually over the years, sands which once were considered too deep become attractive prospects, and each new boom sees more structures tested in deeper sands.

There is a further dampener on enthusiasm in that finding structures and finding oil are not necessarily synonymous in this region. Neither does finding oil under a structure ordinarily mean that any substantial part of the area within the closing contours will be productive.

This is the first of three reports on exploratory and development operations in the Rocky Mountain region which is currently receiving one of the most active plays in its history. Three successive years of increasingly fruitful wildcatting have sharpened the focus of interest in current development and future prospects. In an extended visit to Rocky Mountain operating centers such as Denver and Casper, the author talked with company and consulting geologists, operating executives and representatives of government agencies who are in charge of leasing and operations on extensive government acreage in the region.

That about sums up the pessimistic side of the story. The optimistic side is that even if the established operators are convinced of their most pessimistic summaries of future prospects, they have no intention of being caught napping if they are wrong. They are just as aggressive in getting acreage, making deals, and promoting wildcat tests, as any of the many newcomers.

Inner Basin Prospects

Furthermore the present prospecting has one major new angle, in that geophysics is being used on a constantly expanding scale to explore subsurface conditions. Previously, the prospecting had been mainly confined to surface structures which lie around the edges of sedimentary basins close to the mountain uplifts that form the rims. The Big Horn Basin is a classic example with the surface structures practically outlining the basin. (Fig. 1). Farther out in the basins, the surface is generally covered by a blanket of Tertiary and recent formations that conceal any structures that might be present. Now the geophysicists are probing beneath the surface overburden for hidden structures and lines of folding.

The vertical section of the sedimentary rocks is naturally thinner near the outer rim of the basins. Thickening probably occurs rapidly toward the center or bottom of the basins. If beyond the lines of structural folding around the basin rims the sedimentary deposits are just smooth blankets of constantly increasing thickness toward the bottom of the basin, then the formations now found productive in rim structures might well be many thousands of feet deeper farther basinward. The deepest pays now being developed in rim structures are the Permian Embar, Pennsylvanian Tensleep and Mississippian Madison, which are frequently 4,000 to 6,000 ft. deep.

Obviously if the sedimentary deposits are smooth blankets of constantly increasing thickness toward the bottoms of the basins, even the Upper Cretaceous formations that have produced oil at many places, might well prove too deep for testing. Furthermore, if there are no lines of folding inside the rim structures, there are no traps to form oil reservoirs, even though the formations could be reached by the drill.

There always have been many geologists who questioned this hypothesis of smooth blankets of constantly increasing thickness. They did not believe that the forces which resulted in the mountain uplifts and the lines of folding around the rims could fade out so quickly. However, it would cost much to prove these contentions and until recently the economics of the Rocky Mountain oil situation were discouraging.

The region is an expensive one in which to operate, because distances are great, population is sparse, transportation facilities are few and costly, while the winter climate requires special and high-cost equipment. So long as the oil production of the region is merely sufficient, or not quite sufficient, to supply local markets, these expensive operations do not matter. Incoming competitive refined products from other regions have to bear expensive transportation costs and this equalizes the situation.

However, the minute the Rocky Mountain region production exceeds local demands by any substantial amount, requiring an export outlet to other areas, the whole picture changes drastically. Then all the regionally expensive production operations have to carry the additional burden of a high transportation cost to reach an outside market in which the sale price is established by com-

petitive crude and products from regions with more favorable operating costs.

Under those conditions, there was no incentive to risk searching the inner basins for oil as long as the rim structures were developing all the oil the region needed. A combination of circumstances has now tipped the scales in favor of testing the inner parts of the basins. Tertiary production has been found in a few places in the region, adding shallower horizons to the list of potential pays. Exploration in the interior of similar basins in other parts of the country has proven that uplift folding often does exist away from the rim and frequently is of sufficient magnitude to bring potential producing horizons within reach of the drill. Geophysics has improved its techniques and methods and demonstrated its ability to locate such lines of buried folding. Finally the wartime demand for oil provided the economic incentive, and this was capped by a reduction in royalty rates for new discoveries on government land.

It is too early to say what the result will be of the geophysical exploration work in the interior of the various basins. None of the recent discoveries is an inner basin reservoir; therefore the final proof, finding and developing a paying oil field is still to come.

However, a few things are obvious. First, the number of geophysical crews working in the basins is steadily increasing. Second, the companies that first engaged in this work are still active, usually on an enlarged scale. Third, acreage trading in such areas is active and numbers of large blocks are being taken.

This combination indicates that the geophysical crews are probably finding lines of buried folding and evidence of the existence of good local structures on these folds. Also it probably indicates that the buried folding is of sufficient magnitude to lift at least the Cretaceous formations, which generally produce fairly light oil, within economic reach of the drill on the local structures. There are always chances of Tertiary production in the basins since the fact that few Tertiary fields have been found to date may be due to the fact that the formation is absent over most of the rim structures previously drilled, or present only in a thin section on top. But the strength and scope of the present basin play would hardly be justified by the geologists on the basis of Tertiary possibilities alone.

The general method being followed in the geophysical search is reconnaissance by gravimeter followed by detailing with seismograph. Interpretation of gravimeter surveys is assisted materially by the fact that the border structural pattern around the rims is visible on the surface. Consequently, as geophysicists work into the covered

(Continued on page 47)

Map courtesy Shoenfelt's Petroleum Information, Conoco Building, Denver

Fig. 1—Base map showing surface structures in portions of Wyoming, Colorado and Utah

THIS WEEK

PRICES— Reports seep out of Washington that Office of Price Administration will ignore replacement cost in current survey of petroleum prices. . . . Chief executive of fuel-price branch clinging to earnings as only tangible evidence of price-control hardship. . . . Some elements may need price relief, he says, leaving door ajar for high-cost operations. . . . No clue yet when results of survey may become public information. . . .

INTERNATIONAL—Revised Anglo-American oil pact submitted to President's committee for study. . . . PAW reported satisfied with agreement in revised form. . . . If any substantial revisions are made in President's committee conferences, it will be reviewed again by Senate foreign committee before transmittal to British. . . . ¶Venezuela's 1944 crude-oil production sets new record; the high mark will be exceeded this year, unless unforeseeable developments intervene. . . . ¶Mexico's refining program calls for processing 42,000,000 bbl. this year, relying in the final quarter on new facilities now under construction. . . .

MANPOWER—Full significance of more stringent deferment rules permeating industry. . . . Speed urged in returning manpower questionnaires to PAW. . . . Deferment quota established, meaning tardy respondents may be disqualified. . . . Full instructions on procedure, copies of forms available at PAW regional offices, and at Washington. . . . Contractors, independents and small companies most likely to be hurt unless prompt action is taken. . . .

TRANSPORTATION—Railroads prepare to take larger part in rising shipments to Pacific Coast. . . . Current rail movement to Atlantic seaboard running more than 70,000 bbl. daily behind schedule. . . . ¶Drum shipments of kerosene to New England area rise to 15,959 bbl. daily, slightly below record set last year. . . . ¶Big-inch lines sustain performance despite weather handling 319,977 bbl. daily of crude and 228,864 bbl. of products, both rates above previous February levels. . . .

PRODUCTION— Declines in Kansas and Arkansas offset increases in Texas, California and few other scattered states. . . . Texas operators worry about meeting full PAW quota for March, particularly of sweet oil. . . . ¶Allowable cut faced by West Edmond operators to arrest decline in pressures. . . . ¶Increase of 3,050 bbl. in California daily output originates mostly from Elk Hills.

DRILLING—Completion of 522 wells last week sets new peak for 1945, increase of 62 over previous 7 days. . . . Current activity 45 per cent higher than at same time year ago. . . . ¶Eastern states and Texas setting pace with increase of 60 and 50 per cent, respectively. . . . ¶Texas has averaged 132 completions weekly since start of year. . . .

NATURAL GAS— New 18-in. line proposed from East Texas to Ohio, costing $23,500,000. . . . ¶Louisiana considering new natural-gas legislation to promote conservation, enforce ratable purchases. . . . ¶Several new pipeline projects and expansion programs will increase outlet from Carthage field, East Texas, to northern and eastern markets. . . . Carthage developing into one of nation's biggest fields, covering 175,000 proven acres.

SUPPLIES— Kerosene stocks on East Coast continue recession. . . . ¶War Department keeps secrecy lid on fuel specifications for jet engines. . . . Fuels of kerosene type and approximate specifications will play increasingly important part in final stages of Japanese war. . . .

Official Photo U.S. A.A.F.

The expression "Allied bombers were over German oil targets again today in force" has much more significance than the mere words suggest. Bomb pox are so closely spaced in this aerial photo that it seems impossible for much of the equipment to have remained in service. The Army Air Forces claimed direct hits and partial destruction of the gas-treating plant; compressor plant; nine storage tanks, and barracks at the Zeitz, Germany, synthetic oil plant during the attack, results of which are shown here

Hill Becomes Officer of Petroleum Advisers, Inc.

NEW YORK.—Election of George H. Hill, Jr. as vice president of Petroleum Advisers, Inc., a management and technical unit coordinating the activities of petroleum operating companies, was announced this week by W. Alton Jones, president of Cities Service Co.

G. H. HILL

Hill leaves his post as executive vice president and general counsel of Defense Supplies Corp., a position he has held since 1942. For 10 years previous to that he served successively as attorney and counsel for R.F.C., general counsel for R.F.C. Mortgage Co., and general counsel for Defense Supplies Corp. He is a Mississippian and received his Law Degree from the University of Mississippi in 1930. He had been admitted to the State Bar at the age of 19, and was at that time Mississippi's youngest lawyer.

As vice president of Petroleum Advisers, Hill will assist the president of Cities Service in connection with the company's work of supplying the government with war materials such as 100-octane gasoline, butadiene, special lubricants and ordnance. He will also aid Jones in carrying on the war activities in which he is engaged as president of War Emergency Pipelines, Inc., and in various posts in the Petroleum Administration for War and Petroleum Industry War Council.

Acquisiton of Navarro by Continental Completed

PONCA CITY. — Stockholders owning more than 80 per cent of the issued and outstanding stock of Navarro Oil Co. have accepted the offer of Continental Oil Co. to purchase their stock at $46.50 per share and pursuant to the terms of the offer, have delivered their stock to the Union National Bank of Houston, it was announced at Continental's offices here this week.

Primarily to permit Navarro stockholders now in the armed forces to avail themselves of the offer, Continental Oil Co. plans to extend the time within which the offer can be accepted to March 31, 1945, it was said.

Lend-Lease Oil Shipments Valued at $1,568,184,000

WASHINGTON.—Petroleum products lend-leased during the war have constituted 5 per cent of all lend-lease transfers, although total shipments for use by our allies represents less than one-tenth of U. S. oil production, the eighteenth lend-lease report revealed last week. During 1944, two-thirds of petroleum shipments were aviation and motor gasoline.

Total cumulative value of lend-lease shipments of petroleum to January 1, 1945, reached $1,568,184,000.

The United Kingdom was consigned $1,071,000,000 worth during the 41 months to December 1, with $608,000,000 worth, chiefly aviation and motor gasoline, shipped during the first 11 months of 1944.

By December 1, the China-Burma-India theater had received $71,000,000 worth of petroleum products, chiefly special varieties obtainable only in the U. S. British Middle East oil resources supply the major portion of the oil for C.B.I. Completion of the 2,000-mile pipe line along the Stilwell Road, and delivery of a new fleet of 15,000 American-made trucks to China will increase aid to this area.

Other cumulative figures of petroleum shipments by area, to December 1, 1944, include: $66,000,000 to the U.S.S.R.; $78,000,000 to Africa, the Middle East and the Mediterranean area; $207,000,000 to China, India, Australia and New Zealand, and $13,000,000 to other countries.

Rocky Mountain Association Establishes Office in Casper; Officers Are Elected

CASPER.—Rocky Mountain Oil & Gas Association, recently reorganized, has established permanent offices in Casper, with H. O. (Tex) English as executive secretary. It is intended to coordinate activities, study administrative problems and make a general survey of operations in the region covered. The association affords opportunity for discussion and an exchange of information concerning development and production practices, with particular reference to the Rocky Mountain area, making it possible to help companies moving into this territory.

The newly elected president, Paul Stock, of Cody, Wyo., an independent operator for 35 years in this area, organized Stock Oil Co. in Cody and later Yale Oil Co., which recently was purchased by The Carter Oil Co. James Donoghue, first vice president, is president of Mackinnie Oil & Drilling Co. A. B. Cobb, second vice president, is the owner of Home Oil & Refining Co. of Great Falls, Mont.

A recent meeting of the association was attended by: Jim Maroney, Sinclair-Wyoming Oil Co.; J. F. Cullen, Stanolind Oil & Gas Co.; George Jarvis, Wyalta Oil Co.; H. Leslie Parker, independent; Charley Warren, Shell Oil Co., Inc.; D. T. Hoenshell, General Petroleum Co.; Jack Cole, Ethyl Corp.; G. E. Robertson, Barnsdall Oil Co.; E. G. Lemmers, Trigood Oil Co.; H. O. (Tex) English, executive secretary; Paul Stock, president; Fred Goodstein, Trigood Oil Co.; Jim Donoghue, first vice president, Mackinnie Oil & Drilling Co.; Carroll Kirk, Kirk Oil Co.; Charles S. Hill, independent; Gilbert J. Mueller, Argo Oil Corp.; H. A. Stewart, The Texas Co.; F. W. Bruner, Carter Oil Co.; R. B. Curran, Carter Oil Co., and Glenn Nielson, Husky Refining Co. Center: Don Griffin, Ohio Oil Co.; Pete Gillespie, representing supply, service and specialty companies; Walter Krampert, consulting geologist; Kenneth Davis, Cut Bank Refining Co., and J. A. Deffeyes, Pacific Western Oil Corp.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

The Independent Refiner

THE careful study which independent refiners as a group are giving to their postwar planning augurs well for future trends in refining generally. In fact, it is a good omen for the entire petroleum industry.

Just where the term "independent" starts and where it ends in classifying refinery operations is a moot question. For the purpose of this discussion it will be assumed that it includes approximately 300 of the 450 operating plants in this country. These 300 plants are owned by companies and individuals who are largely or solely dependent on the spread between the delivered cost of crude oil plus manufacturing expense and what is received for products. They have no profits in production, transportation or any other phase of petroleum operations to offset unprofitable refinery margins. What happens to them from year to year profitwise depends on what happens within the refinery fence.

Too often in the past independent refinery operations reflected unhealthy conditions in crude-oil production. Plants were quickly built to absorb flush production in new fields. Little thought was given to other factors which must be reckoned with in permanent refining activities.

These mushroom plants enjoyed a feast until production dropped and additional competition arrived; and then a famine set in, with fatal results in many instances. The tendency in this method of refinery operation was to overproduce and to flood markets with excess products which depressed all prices to unprofitable levels during most of the thirties. Fortunately in 1940 and early 1941 product prices advanced so that when the war ceilings were established the operating margins, with few exceptions, were satisfactory.

The war period, with its arbitrary regulations, has brought many changes and their full significance to refiners will become apparent as soon as peace arrives. Crude-oil supplies of many refineries will have changed permanently, and nothing could be more important to the smaller operators.

Changes in pipe lines and other transportation facilities will bring permanent shifts in peacetime marketing areas. Petroleum merchandising practices are undergoing important revisions and this fact will be reflected in available outlets for the refiner who is dependent on wholesale markets.

Independent refiners are analyzing these and other developments which will have a bearing on their postwar positions. No problems ahead are unsurmountable. Processes available to the smaller plants will enable them to keep pace with their large competitors in the matter of quality of products and plant efficiency.

Overproduction and its resulting evils can be avoided if trends in postwar demands are closely watched. Net profits to scattered plants are largely dependent on how well operators utilize their local markets. Short hauls in tank cars or trucks or participation in low-cost pipe-line movements are the only way out for the local refiner.

Nothing has vitally changed the competitive position of the independent refiner. If he charts his course carefully, he can avoid the pitfalls of the past and take full advantage of those characteristics of resourcefulness and flexibility which have given the oil industry a strong independent manufacturing division from its beginnings.

Venezuela Sets New Record In Crude-Oil Production

Output for 1944 Up 77,607,000 Bbl. Over 1943, Representing 47 Per Cent Increase

NEW YORK. — Crude-oil production in Venezuela reached a new high in 1944, amounting to 257,005,000 bbl., according to preliminary estimates. This is an increase of 77,607,500 bbl. or 47 per cent over the 1943 production which was 179,397,500 bbl.

A feature of the year's results was the relatively sharp rise in production in eastern Venezuela, where output rose to a record of 83,806,000 bbl., more than double the previous year's total. The actual gain in 1944 was 49,278,500 bbl., or 142 per cent.

Western Venezuela, chiefly the Maracaibo Lake district, produced 183,199,000 bbl. of crude during 1944, also a record, and an increase of 38,329,000 bbl., or 26 per cent, over the 1943 yield of 144,870,000 bbl.

In terms of daily averages, production in all of Venezuela in 1944 averaged 702,200 bbl. daily, compared with 491,500 daily in 1943. Of the total, western Venezuela contributed 501,900 bbl. daily in 1944 and 397,000 daily in 1943, while eastern Venezuela produced 200,000 daily in 1944, against 94,500 in 1943.

The previous record annual production in Venezuela was 223,784,000 bbl. in 1941. Output in 1942 and 1943 was adversely affected because of tanker shortages, which restricted shipments and therefore depressed production.

Currently Venezuelan output is reported to be running somewhat higher than the average for 1944 of 702,200 bbl. daily.

The largest producing oil field in Venezuela in 1944 continued to be Lagunillas which is reported to have produced close to 80,000,000 bbl., a rise of about 33⅓ per cent over 1943. Although total output estimates are not available, the greater Jusepin oil field contributed to a major degree in the sharp rise in output in eastern Venezuela during 1944.

Because of the increase in transportation capacity out of the greater Jusepin district, shipping facilities out of Venezuela can now handle more than 900,000 bbl. daily, and many look for the nation to establish another all-time record in 1945.

Four Cities Service Men Promoted

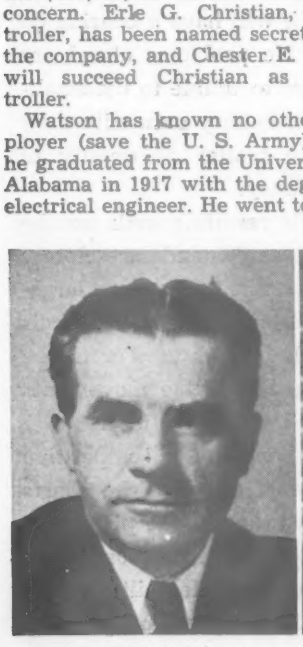
NEW YORK.—Four promotions in the official family of Cities Service Co. were announced last week by W. Alton Jones, president.

Burl S. Watson, a director of the company since 1940, has been elected a vice president. Ernest H. Johnston has been elected treasurer of the $860,000,000 oil and natural gas concern. Erle G. Christian, comptroller, has been named secretary of the company, and Chester E. Weger will succeed Christian as comptroller.

Watson has known no other employer (save the U. S. Army) since he graduated from the University of Alabama in 1917 with the degree of electrical engineer. He went to work with a Cities Service subsidiary in Toledo, Ohio, as a training school cadet in which capacity he did everything from running streetcars to working on the books. He came to New York in the early 20's, and was made assistant to Jones in 1930. He became president of 60 Wall Tower, Inc., and was largely responsible for the construction of the world's third tallest building, in which Cities Service makes its headquarters. In 1940 he was made assistant to Temple W. Tutwiler, president of Petroleum Advisers, Inc., a management and technical group coordinating the activities of Cities Service's various petroleum operating companies. He was made executive vice president of the petroleum unit in 1942. Watson is also an officer or director of a number of petroleum, natural gas and electric utility subsidiaries, and is in general charge of Cities Service's realty holdings in lower Manhattan.

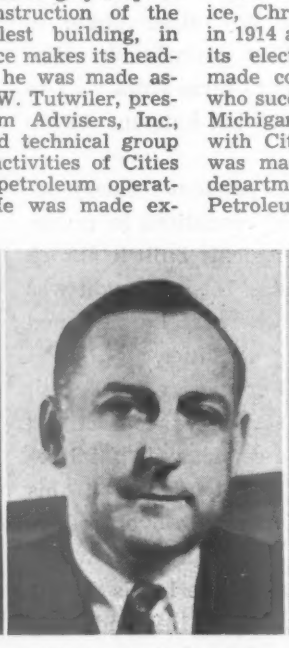
Johnston, a graduate of the University of Illinois in 1907, has been with the Cities Service organization for 38 years, and a member of its board of directors since 1916.

The new secretary of Cities Service, Christian, joined the company in 1914 as a meter reader for one of its electric subsidiaries. He was made comptroller in 1939. Weger, who succeeds him, is a University of Michigan graduate, and has been with Cities Service since 1916. He was made manager of the budget department in 1924 and treasurer of Petroleum Advisers, Inc., in 1938.

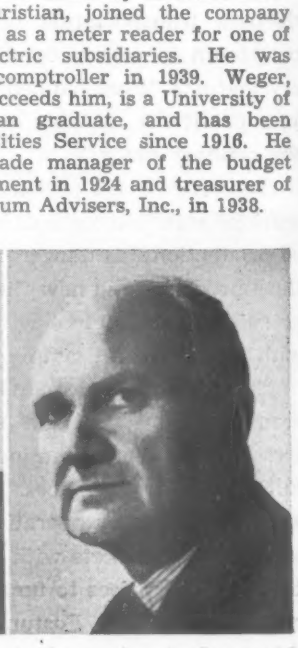


BURL S. WATSON

ERNEST H. JOHNSTON



ERLE G. CHRISTIAN



CHESTER E. WEGER

Vigorous Play Keeps Rockies in Spotlight

(Continued from page 42)

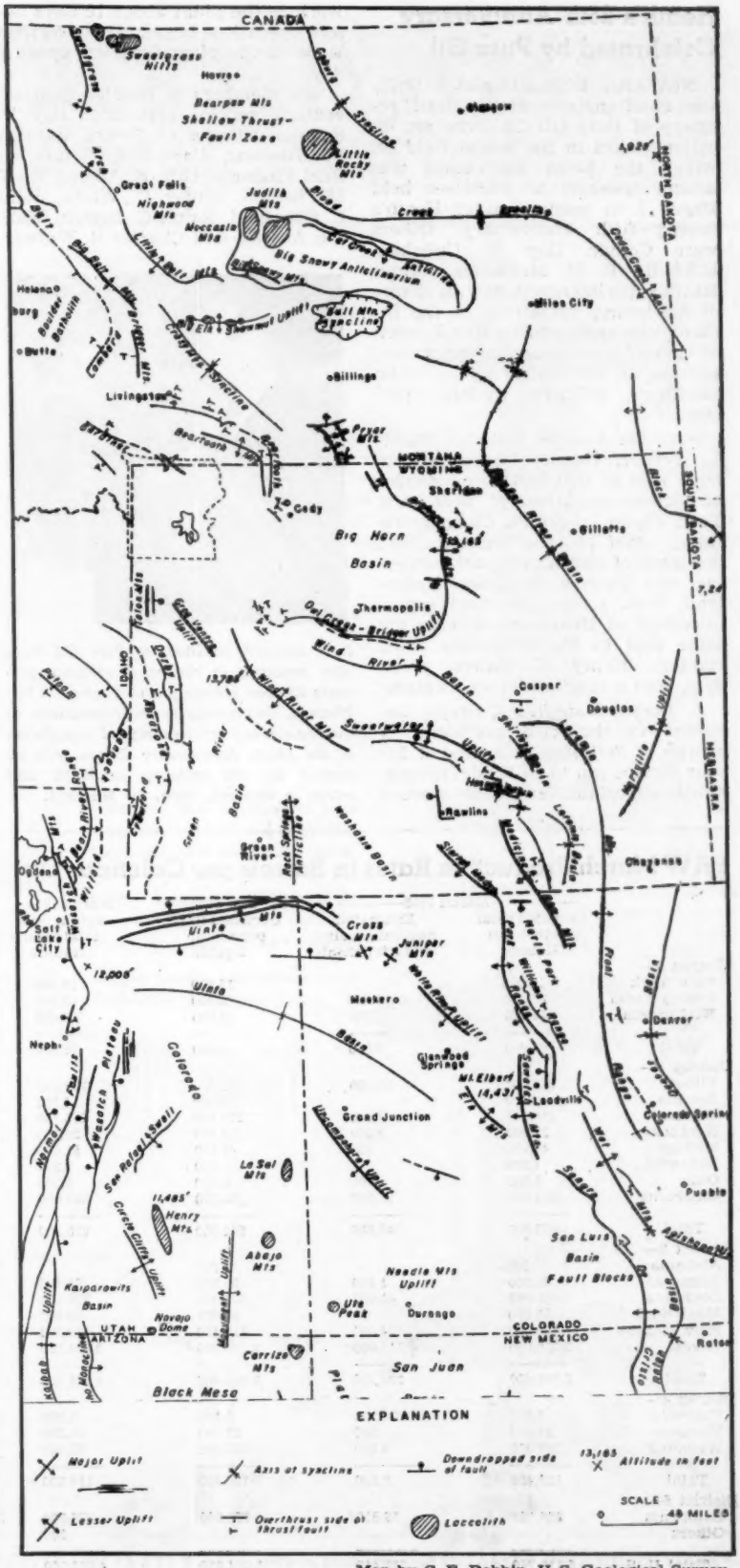
area and unknown territory, they have an established border pattern into which their interpretation of recorded results in the unknown territory must fit logically. Continued efforts and increasing numbers of parties would indicate that results are given, showing structural folding that fits logically into the tectonic picture established by conditions around the basin rims.

Much of the geological and geophysical activity has been concentrated in the Big Horn basin, the Wind River-Shirley basin, the Green River basin, the Washakie basin, the Uinta basin, and the Powder River basin. All of these (See Fig. 2) except Powder River, lie in the western part of Wyoming and the northwest part of Colorado. The Powder River basin occupies most of northeastern Wyoming. There has been activity in Montana, and it continues, but this is on a lesser scale. The acreage play, however, has spread into eastern Idaho, centering around Bonneville and Caribou counties, where a line of surface folding is exposed. Developments at the Rangely field, in northwest Rio Blanco County, Colorado, only a few miles from the Utah line, have aroused much interest in the Uinta basin. (Fig. 2.).

Making plays in the Rocky Mountain area is both complicated and simplified by the large area of federally owned or supervised land. It is complicated by the ease with which anyone with patience and knowledge of how to deal with the government red tape can tie up relatively large amounts of acreage for a long time with a comparatively small amount of cash. There are hampering restrictions in the law that govern the amount of federally owned land that can be held on a single structure, and the total amount that may be held in one state by an individual or company.

On the other hand, problems are simplified quite often, when the federal Government is the only landowner. The government agencies are usually staffed, locally at least, with competent geologists, engineers and technologists, who are fair minded.

Moreover, unitization agreements are not only favored by the government, but under the new royalty rates, economic incentive is added. Unitized acreage is not charged against the acreage limitations permissible to a single operator under the old leasing act. If an oil discovery is made, the reduced royalty rates applicable to new discoveries, automatically apply to the entire unitized area.



Map by C. E. Dobbin, U. S. Geological Survey

Fig. 2—Main structural features of the Rocky Mountain region

Heath's 25th Anniversary Celebrated by Pure Oil

NEWARK, Ohio.—Daniel E. Sullivan, chief engineer at the Heath refinery of Pure Oil Co., who set location stakes in the wheat field on which the plant was built, was among speakers at exercises held March 1 in celebration of Heath's twenty-fifth anniversary. Others were Comdr. Roy H. Callahan, U.S.N.R.; R. D. McClaran, former Heath superintendent, now in charge of marketing operations in the Indianapolis area, and G. Ray Fenner, of Columbus, manager of marketing operations in central Ohio. John Stadtherr, refinery chemist, presided.

Pure Oil visitors included Russel L. Vernor, Heath's superintendent from 1920 to 1923 and now manager of marine operations at Beaumont, Tex.; Clyde L. Smith, Chicago, refinery chief process engineer, who did some of Heath's original surveying, and Irwin L. Hostetler, Nederland, Tex., former assistant superintendent of Heath and now in the same post at Pure's Smiths Bluff refinery. Henry M. Dawes, president, sent a congratulatory message.

J. Porter Langfitt, Chicago, assistant to the vice president in charge of refining, presented a 25-year service pin to E. E. McPherson, Heath superintendent, who started work in the plant about 10 days before operations began. About 50 men were in the plant force on opening day.

The members of Heath's quarter-century service club are: Ray T. Schuler, Charles G. Swart, William F. Nikolaus, Carroll E. White, J. Burl Fluharty, Otto E. Adams, E. E. McPherson, Elmer E. White, John E. Oberfield, Ralph C. Brown, Warren A. Rice and Charles R. Walters.

J. P. Langfitt, assistant to Pure Oil Co.'s vice president in charge of refining, presents 25-year service pin to Eugene E. McPherson, Heath refinery superintendent, at quarter-century anniversary of completion of the plant. Anniversary dinner was attended by 400 refinery employes and wives in Newark, Ohio, on March 1.

PAW March Production Rates in Barrels per Calendar Day

	March 1945 Certified total petroleum liquids	March 1945 Estimated natural gasoline and condensate	Feb. 1945 Certified total petroleum liquids	March 1944 Actual prod. total prod. liquids
District 1—				
New York	13,000	.....	13,000	12,900
Pennsylvania	40,300	1,300	40,400	42,200
W. Virginia	14,700	6,500	15,000	15,400
Total	68,000	7,800	68,400	70,500
District 2—				
Illinois	210,000	12,000	210,000	230,000
Indiana	12,000	.....	12,000	14,500
Kansas	278,300	4,300	279,000	278,700
Kentucky	35,200	3,200	35,800	26,400
Michigan	47,700	700	47,850	51,600
Nebraska	1,000	...	1,000	1,300
Ohio	8,600	600	8,500	9,100
Oklahoma	391,000	28,000	388,500	367,000
Total	983,800	48,800	982,650	978,600
District 3—				
Alabama	300	....	300	.....
Arkansas	85,200	5,200	85,200	85,100
Louisiana	400,000	40,000	397,000	375,100
Mississippi	53,000		53,000	40,900
New Mexico	109,900	4,900	110,100	119,700
Texas	2,316,000	156,000*	2,290,000	2,004,800
Total	2,964,400	206,100	2,935,600	2,625,600
District 4—				
Colorado	9,500		9,500	7,300
Montana	23,300	300	23,300	24,200
Wyoming	103,600	3,600	103,600	87,800
Total	136,400	3,900	136,400	119,300
District 5—				
California	966,160	58,810†	951,800	876,800
Others	.....	.....	.....	100
Total U. S.	5,118,760	325,410	5,074,850	4,670,900

*Includes 16,000 bbl. daily average separator condensate over and above anticipated plant production. †Includes 6,200 bbl. daily average Paloma condensate production.

DEATHS

Harry O. Powell, 60, vice president of Mid-Continent Supply Co., died unexpectedly at his home in Fort Worth February 26.

C. P. Sheldon, 64, died of a heart attack in Electra, Tex., February 25, shortly after receiving news from the War Department that his grandnephew, Lt. Marshall C. Dunn, a pilot, had been killed in action.

Cpl. Clarence S. Garrard, Shreveport, a photostat operator for United Gas Pipe Line Co. when he entered military service in 1942, was killed in action in Belgium December 25. He was a paratrooper.

George Wittmer, Jr., 75, retired oil and gas operator of Allison Park, Pa., near Pittsburgh, died February 28 in Abilene, Tex., where he was visiting a son, George Wittmer, III. With three brothers, Wittmer acquired extensive holdings in Pennsylvania, New York, Ohio, Michigan, Oklahoma and Texas. He retired in 1942 as president and general manager of Wittmer Oil & Gas Properties, later dissolved. He had been associated also with American Natural Gas Co.

Alex Calvert, 65, who died recently at Windsor, Ont., drilled in the Ontario fields and later in Persia and Borneo.

Frank L. Hadley, 64, developer of oil and gas properties and supervisor of important pipe lines, died February 27 in Philadelphia. In 1937 Hadley was made vice president in charge of operations for the Susquehanna System, an amalgamation of four pipe-line companies operating in Pennsylvania, New York, New Jersey, and Ohio. During the preceding 7 years he had served as general manager. In the course of his business career he had been president of Commonwealth Petroleum Corp., Philadelphia; Eddystone Oil Corp., New York; Western Union Oil Co., and Columbia Oil Producing Co., Los Angeles; National Petroleum Corp. of West Virginia. He also had been vice president of Union Oil Co. of Delaware and general superintendent of Sun Pipe Line Co. in Philadelphia. He was made a vice president and director of Sun in 1938.

C. P. Shelton, 64, retired independent oil producer, died February 25 in Electra, Tex.

Thomas E. Smith, 52, oil man of Liberty, Tex., died February 24.

Robert A. Salts, 52, assistant division manager of Phillips Petroleum Co. in Tulsa, died March 6 in an Oklahoma City hospital.

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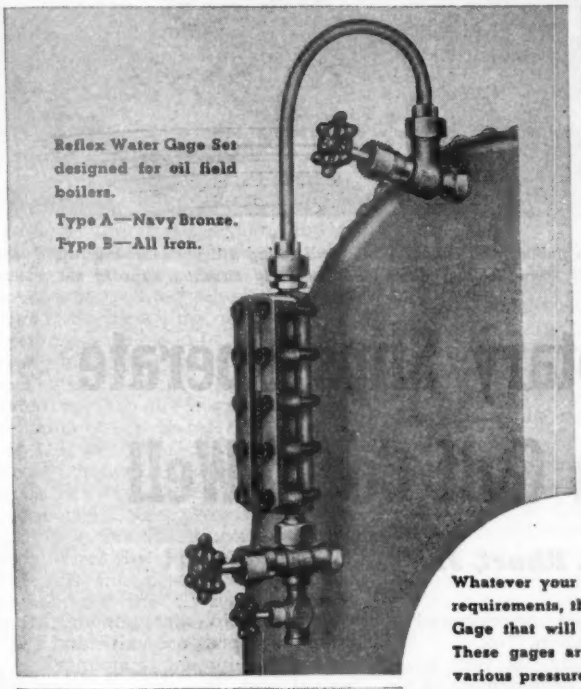

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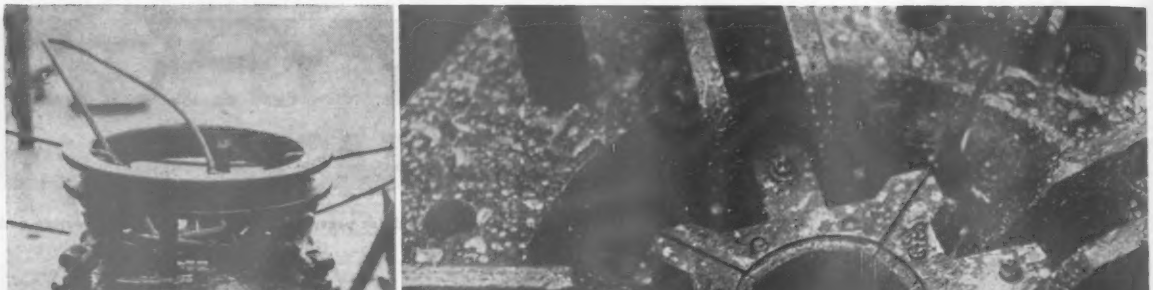


Fig. 1—(Left) Power-operated slip assembly set to one side before pulling drill collar. While drill collar will pass through raised slips, hand slips are used on last joint of drill pipe. Fig. 1A—(Right) View looking down slip assembly showing slips in set position

Power-Driven Rotary Slips Operate Successfully on Gulf Coast Well

by E. H. Short, Jr.

IN discussing postwar rotary rigs, several Gulf Coast oil executives recently expressed the need for greater automatic control, and predicted that such an improvement would take place in the form of a gradual mechanical evolutionary process. While it is possible that greater automatic control might bring about some reduction in the over-all drilling time now required, many who are closely connected with drilling operations feel that the most important contribution would be in respect to safety and manpower.

The recent installation of power-driven rotary slips by Stanolind Oil & Gas Co. on one of its Gulf Coast rotary rigs appears to be a definite step in the direction of automatic control. This rig is drilling 1 Adolph Suderman, located approximately 3 miles south of Alvin, Tex.

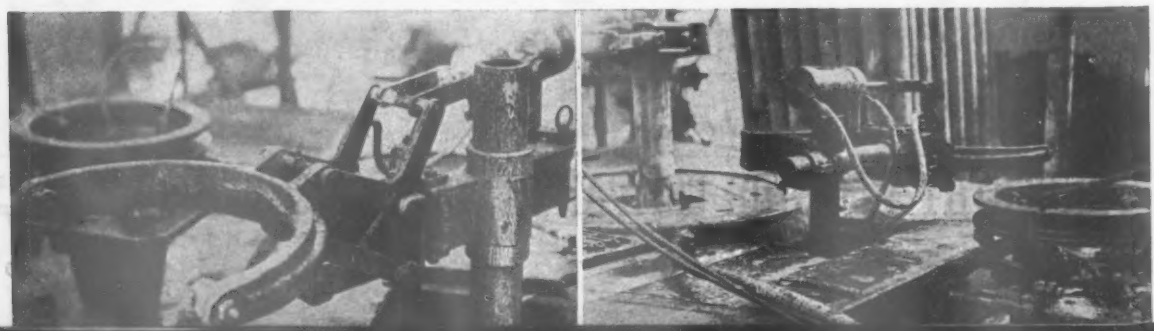
That the industry is very much interested in the development of automatic control is evidenced by the fact that the Stanolind rig has been visited by a large number of Gulf Coast engineers and production executives since the installation of the power-driven slips.

To facilitate description, the mechanism of power-driven slips may be divided into three major parts, viz. the slip assembly, the actuating mechanism, and the air-compressing equipment. Fig. 1 shows the roller track (top portion), slip toggles and slip bowl. Fig. 1A is a view looking down on Fig. 1, and shows the four slips in a set position.

Fig. 2 is a closeup of the slip-actuating mechanism, consisting of a 4 in. by 8 in. air cylinder, lifting yoke, back-pressure valve and swivel. This equipment is mounted on a swivel post, the base of which has been welded to the skid section of the rotary. When not in use, the slip-actuating mechanism is swung completely away from the rotary table, as shown in Fig. 2A. When tearing down, this portion of the power-driven slip equipment easily may be removed by simply unbolting the companion flange.

A 1-hp. compressor unit furnishes air at 125 lb. pressure for slip operation, and the 60-gal. tank serves as storage capacity. The installation for coming-out or going-in operations is comparatively simple, requiring only a few minutes' time. Standard slips are set for the first joint going in and for the last joint

Fig. 2—(Left) Closeup of slip-actuating mechanism. Yoke which raises and lowers slips is in left foreground. Fig. 2A (Right) Power-driven slips completely out of the way while breaking bit



coming out. In going in, for example, the standard hand slips are set at the first joint above the drill collar. The slip assembly is picked up by means of the elevator, as shown in Fig. 3, and let down over the drill pipe. The pipe is then picked up, the hand slips pulled, and the power-driven slip assembly lowered into place. The bowl for the slips extends into the master bushing and a guide is provided to insure that tool joints will be guided through without interference in running and pulling pipe. Fig. 4 shows the power-operated slips in position, after the hand slips have been pulled. Fig. 5 shows the complete assembly in operation. The slips have just been raised.

Accidental Setting Impossible

Perhaps the first question, and a very important one, which occurred to outside company men observing the power-operated slips in operation for the first time, was whether or not the slips could be accidentally set while running in. The actuating mechanism, however, has been designed so that the slips cannot be accidentally set. In referring to Fig. 5 it will be noted that a spring is situated between the two members which join the actuating mechanism to the yoke. The pressure exerted by this spring is always against a latch. When the slips are raised this latch falls into place, making it impossible for the slips to fall and catch the pipe. When the slips are to be set, the air pressure acts, not only upon the large piston (shown at right angle to the top of the swivel post)) but also upon a small piston located near the spring. Thus two air-induced movements must take place before the slips can be set, one to overcome the spring which holds the latch securely in place, and the other to lower the slips. These two movements are accomplished by a slight turn of a control lever by the driller.

Fig. 5 shows the location of the air valve which controls the slips. The driller, with left hand on the air-valve lever, is preparing to set the slips.

In the running or pulling of drill pipe, the position floor men have to assume to handle the conventional type of slips is a hazardous one. Not only this, but the throwing and pulling of the slips is regarded by the drilling crew as being one of the most difficult manual operations required on a rig. Through the use of the power-operated rotary slips it is almost unnecessary for the floor men to put their feet on the rotary table during the round-trip operation.

The power-operated slips automatically set evenly, thus eliminating the possibility of damage to the drill pipe which might occur when hand slips are not properly set.

While the advent of power slips is only a step toward greater automatic rotary-rig operation, it appears possible that they may be a forerunner of the important strides which may be well under way before the postwar period—with the introduction of power-driven tongs as the next logical stride.

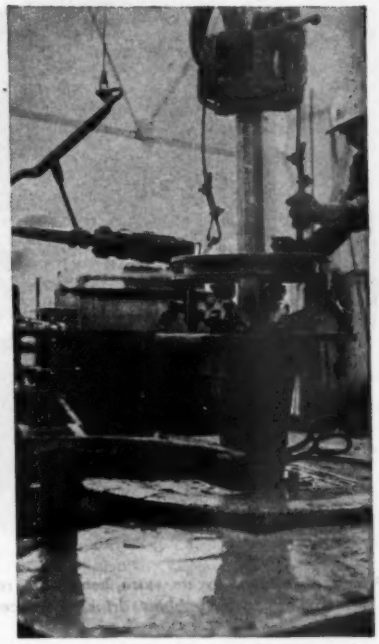
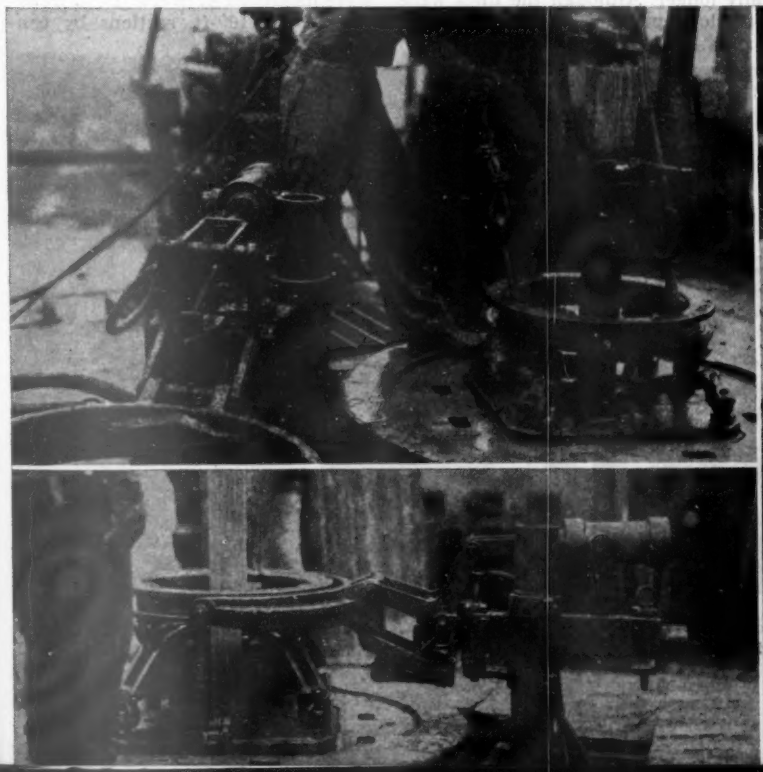


Fig. 3—Slips are picked up and let down over drill pipe and onto hand slips in preparation for hookup of power slips

Fig. 4—(Top, left) Hand slips have been removed and power-slip assembly is in place ready for operation. Fig. 5—(Bottom, left) Completely assembled power-operated slips in operation on Stanolind's drilling rig 3 miles south of Alvin, Tex. Fig. 6 (Right) C. J. Jenkins, Stanolind driller, preparing to set slips. Air-valve lever is operated with left hand, as shown



Primer distributed by an extra head with revolving brushes for eliminating air bubbles, drips, and excess depressions

Reconditioning of Shell Company's Tonkawa-Cushing Parallel Oil Lines

by Paul Reed

Different procedures have been followed at three projects for reconditioning Shell oil lines. Here are reviewed features of the present Tonkawa-Cushing work, and the Kilgore-Houston and McKamey-Cushing projects.

RECONDITIONING of 104 miles of 6-in. pipe, comprising two 52-mile-long parallel lines between Tonkawa and Cushing, Okla., has been carried out this winter by Shell Pipe Line Corp. This is the third large reconditioning project undertaken by this company during the past 2 years, and is part of a long-range program of rehabilitation and modernization. Each project has been purposely handled differently and so planned as to obtain optimum benefits without disrupting essential oil movements.

General Considerations

The two lines were laid separately but within a comparatively short period in 1922 and 1923. Both were of ⅛-in. wall, low-carbon, lap-weld line pipe, with thread-and-coupled joints made up by hand or power-machine methods. Although considerable quantities of sour crude have been pumped through the lines, internal corrosion has been negligible. However, rapidly increasing frequency of leaks due to external corrosion; prevalence of collar leaks, and the lowering of safe operating pressure from 1,000 to 850 p.s.i. indicated that remedial measures should not be postponed any longer. Although the lines were in close proximity, there was no evidence of selective corrosion due to difference in age.

Corrosion Survey

Before formulating specific plans for reconditioning, Shell's corrosion engineers made a comprehensive survey of conditions along the entire length of the lines. In doing this work soil-resistivity readings were taken at 25-ft. intervals. From four successive observations, the high and low values were used in preparation of high and low-resistivity curves plotted against 100-ft. interval scale. Surface potentials were measured between the extremities of the 100-ft. sections by con-

Left: Traveling heater consisting of two heavy-duty kerosene burners, surrounded by a hood and mounted on a carriage for riding the pipe. Right: Operation for removing collars and beveling

tacting the soil over the pipe with copper sulfate electrodes. These potential measurements were verified every 1,000 ft. by observing pipe-to-soil potentials, thus limiting the effect of errors in individual measurements. Such soil potentials were taken along one of the twin lines. Potential between the two lines was measured at 200-ft. intervals. The graphic record included not only the resistivity and potential curves, but also the locations of roads, fences, ponds, washes, and water courses and the locations of all reported leaks.

From this survey it was found that corrosion "hot spots" were so numerous and separated by such short distances that spot treatment would be almost wholly ineffective. This conclusion together with collar troubles influenced the decision to do a complete job.

Procedure

Final plans involved taking up, removal of the screwed collars, repairing of the better joints, coating and wrapping. The lines were relaid by electric welding of all joints. Because the work had to be performed with the minimum interference to shipping schedules, the two lines were cut into three sections each, the lengths being 14 miles, 21 miles, and 17 miles respectively. One section at a time was taken out of service, the remaining sections of the same line operating as loops on the other.

The pipe was uncovered by a ditching machine equipped with a stripping shoe, and a boom tractor was used for lifting the line for placement on skids. A single pass of the cleaning machine removed soil, remnants of pipe coating and heavy corrosion products to permit removal of collars by cutting torch, and preliminary inspection of the pipe. The acetylene cutting head in one operation cut the line behind the collar and beveled the pipe end to 30°. Joints that were bent or required an amount of repair work that might impede progress of the job were hauled to temporary yards for reconditioning. Repaired pipe was returned to the line in single random lengths. Pipe found uneconomical to repair was discarded and replaced with serviceable pipe reclaimed from other locations.

Welding. — Before reconditioning, the pipe was welded into the line by the stovepipe method. Three beads were run using successively ⅛-in., 5/32-in. and 7/32-in. electrodes. Spot welding was usually done with 5/32-in. rod, although some 7/32-in. was used to fill the larger pits.

Cleaning.—All pipe was cleaned by a minimum of three passes of the traveling cleaning machine as follows:

The first cleaning immediately followed the raising of the line. This machine was equipped with knives and wheels for removal of soil, old coating and heavy corrosion deposits, thus preparing the line for removal of collars and preliminary inspection of pipe.

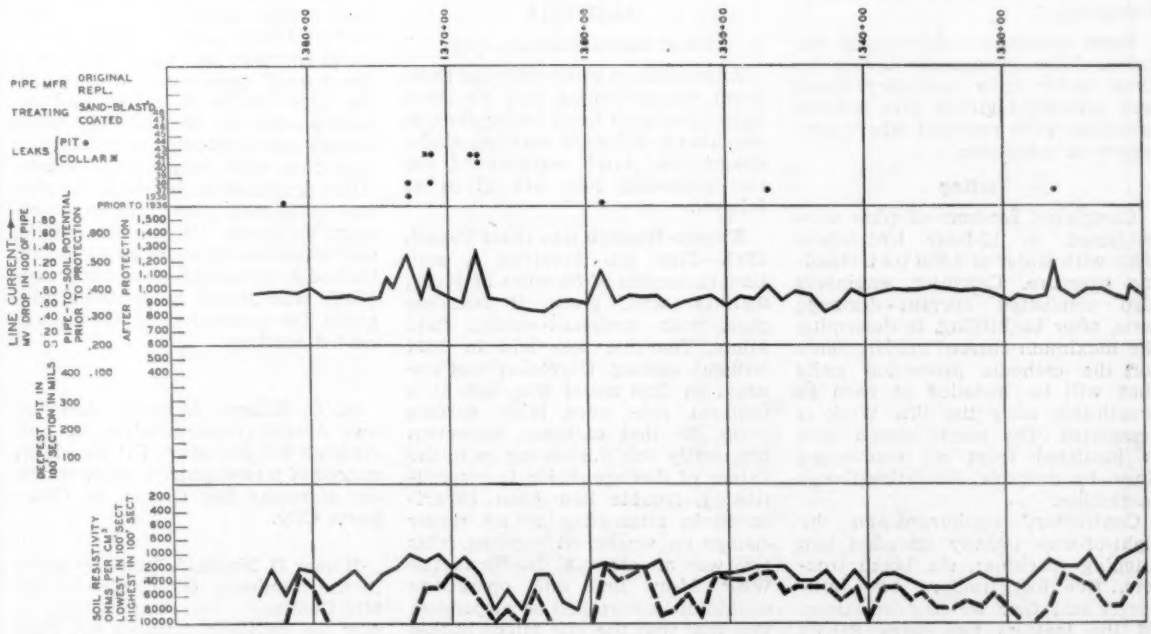
The second cleaning followed the stovepipe welding, spot welding and patching, and was the first pass over the reconditioned pipe. Machine was equipped with knives, brushes, and priming head which applied primer diluted with three parts of thinner. Application of dilute primer at this stage reduces moisture content of remaining corrosion deposits, loosens some deposits for later removal, and improves the bond of the final coating.

The third cleaning machine was equipped with knives, and brushes for removal of deposits raised by the dilute primer, and carried a priming attachment for application of regular primer. Primer was distributed by an extra head of revolving brushes for elimination of air bubbles, drips and excess in depressions.

In addition to the over-the-trench cleanings, pipe processed in the yard was passed one or more times through a stationary cleaning machine.

Because the job was done during winter months, special precautions were taken to insure good bonding despite the low atmospheric temperatures. One such measure was the use of a traveling heater, operated about 150 ft. ahead of the second cleaning machine. This heater, designed and built by the contractor, consisted of two heavy-duty kerosene burners, surrounded by a hood and mounted on a carriage which rode the pipe. This heater not only warmed the pipe but also dried out the corrosion products, thus improving the quality of the succeeding operations.

Coating. — The reconditioning at one time of these twin lines offered an unusual opportunity for comparing the relative merits of dif-



Typical section of the corrosion strip graph of the Shell Tonkawa-Cushing pipe lines

Equipment for cleaning and beveling on the right-of-way

ferent pipe coatings under identical conditions. To take advantage of this circumstance one line was coated with Barrett's standard pipeline enamel, and the other was treated with Barrett's "water works" enamel. Both types of coating were applied with an average thickness of 3/32 in. by a combination coating and wrapping machine and both were covered with a bonded wrapper of asbestos felt.

Preceding the lowering operations, the coating was subjected to a 15,000-volt test. The machine for this purpose was designed and built by O. C. Mudd, corrosion engineer for Shell, and consists of a 300-watt engine-driven generator, transformer, and coil-spring brush.

Ditching and lowering.—The line was relaid in the original trench, which was cleaned out to retain full depth of cover. Slack loops varied from 5 to 10 per mile depending on topography.

Road crossings. — Advantage was taken of the opportunity to case the lines under some secondary roads, and primary highway and railroad crossings were renewed where necessary or advisable.

Testing

Completed sections of pipe were subjected to 12-hour hydrostatic tests with water at 1,000 p.s.i. standing pressure. Corrosion engineers also conducted current-drainage tests, after backfilling, to determine the maximum current requirements for the cathodic protection units that will be installed as soon as practicable after the line work is completed. The reconditioned pipe is insulated from all connecting lines by suitable insulating-flange assemblies.

Contractors' equipment on the right-of-way usually included two ditching machines, six boom tractors, five tow tractors, two bulldozers and four welding machines. Of the tractors two were RD-7's and the others RD-4's and RD-5's. In addition to the above there was special equipment for the cleaning, painting, and wrapping operations together with the necessary number of trucks. Yard equipment consisted of cleaning machine, straightening machine, two sets of welding equipment, and trucks and tractors as required.

Conclusion

O. R. Smith, general contractor, brought to the job an organization experienced in this class of work and produced excellent results despite the handicaps of rain, snow, mud and low temperatures. All inspection work was performed by men drawn from Shell's regular maintenance staff. W. L. Robards acted as chief inspector, and L. B. Nelson, area corrosion engineer who made the corrosion survey, also inspected the application and testing of coating.

ADDENDA

Other Reconditioning Jobs

As mentioned previously the three latest reconditioning jobs on Shell lines have each been undertaken in an entirely different manner, so for comparison, brief resumes of the two preceding jobs are given as follows:

Kilgore-Houston line (East Texas), 1943.—This job involved a continuous section of 80 miles of 10-in., 0.279-in. wall, grade B seamless pipe, with acetylene-welded field joints. The line was laid in 1931 without coating. Corrosion was unusual in that metal was lost at a uniform rate over large surface areas, so that external inspection frequently was misleading as to the extent of damage. Prior to reconditioning, trouble had been experienced in attempting to set repair clamps on weakened sections. This line was an essential feeder to the WEP 24-in. line and operations could not be curtailed or suspended. The fear that the line might buckle or break if lifted under load was confirmed in subsequent operations.

Procedure in this case was to lay a 20-mile loop in a new trench parallel to the original line, after which oil was displaced from the corresponding section of the old line then ready to be taken up. All pipe was hauled to central plants for grading and reconditioning. Repaired pipe was relaid as a loop to the next section. All loops, which ultimately became a continuous line, were electric welded by the stovepipe method, and protected with bituminous coating, asbestos-felt wrapper and cathodic units as determined by tests on the completed line. A unique problem encountered on this job was the deeply imbedded and firmly attached mineral crystals that could not be removed by conventional cleaning machines, even though several passes including one wet cleaning were made. Water of crystallization was vaporized by the hot coating and produced an average of more than one holiday per running foot. Shot blasting was finally adopted and found very satisfactory.

McCamey-Cushing line (West Texas), 1944.—The West Texas project involved 68 miles of 10-in., 0.365-in. wall, grade A, lapweld line pipe. This line was laid in 1928 and had a bituminous coating without wrapper. The total mileage was composed of five isolated sections. This line, too, was operating at its full capacity of approximately 47,000 bbl. per day and could not be released from service. Corrosion was more definitely of the deep pitting type, but the pipe generally was sound. There were some shortcomings found in the original acetylene field welds, especially as to penetration. It was finally decided to uncover the pipe and weld straps over the top of each weld, after which the pipe would be raised and repaired over the trench. Only three breaks occurred during the entire operation and none was serious. After repairs were finished, the pipe was protected with 3/32-in. minimum-thickness bituminous coating and bonded wrapper of asbestos felt. Cathodic protection previously applied was found more than adequate for protection of the newly coated sections.

A. C. Gilbert, formerly geologist and district representative in San Antonio for Devonian Oil Co., is in charge of a new district office which the company has opened in Oklahoma City.

Homer D. Hatfield, formerly scout in the Seminole, Okla., district for Mid-Continent Petroleum Corp., is now in military training at Fort Leavenworth, Kans.

Multistage Weathering of Saturated Absorption Oil

by Henry N. Wade

The author, president of Parkhill - Wade is widely known in the oil industry both in the Mid - Continent and California for his design of plants and development of many processes which are currently used in the natural gas-gasoline field. The subject of this article is one that he has followed through many years and is of special interest at this time.

THE trend of absorption-plant design during the past few years has been toward higher butane and propane extraction, to provide a greater supply of these materials for essential war fuels and for base materials for various synthetic processes. Plants designed for high extraction of these light products necessarily require relatively high oil-circulation rates over the main absorbers, sometimes combined with refrigerated absorber temperatures. These high oil-circulation ratios, with or without artificially reduced absorber temperatures, cause a relatively great increase in the amount of methane and ethane absorbed along with the desired propane, butanes and heavier components. This is because average natural gases are composed of 90 per cent or more of methane, while the desired products account for only 5 to 10 per cent. Thus, increasing oil circulation increases the total amount of methane absorbed in direct proportion to the oil-gas ratio, while the amount of propane and heavier available in the wet gas is limited to a definite relatively small quantity.

In order to be able to condense the desired products in the distillation of the saturated absorption oil it is necessary first to remove most of the dissolved methane and ethane from the oil, while at the same time retaining in it the desired amount of propane, butanes and heavier components.

Process in Older Plants

In many of the older high-pressure plants, where operators were concerned only with extraction of natural gasoline, including enough butane to give the gasoline the required vapor pressure, the saturated oil was weathered or flashed at a pressure just high enough to force the flashed oil through the heat exchangers and preheaters into the still. This pressure was ordinarily around 150 p.s.i. gage. The gas vented from the oil at this pressure would usually contain 0.2 to 0.3 gal. per M.c.f. of natural gasoline, but since volume was relatively small, over-all loss was not serious.

In a plant designed by the writer in 1929 two different weathering pressures were used in sequence, with a resulting sharp reduction of total gasoline lost in the weathering and distilling operations. In this case the absorber pressure was 610 p.s.i.

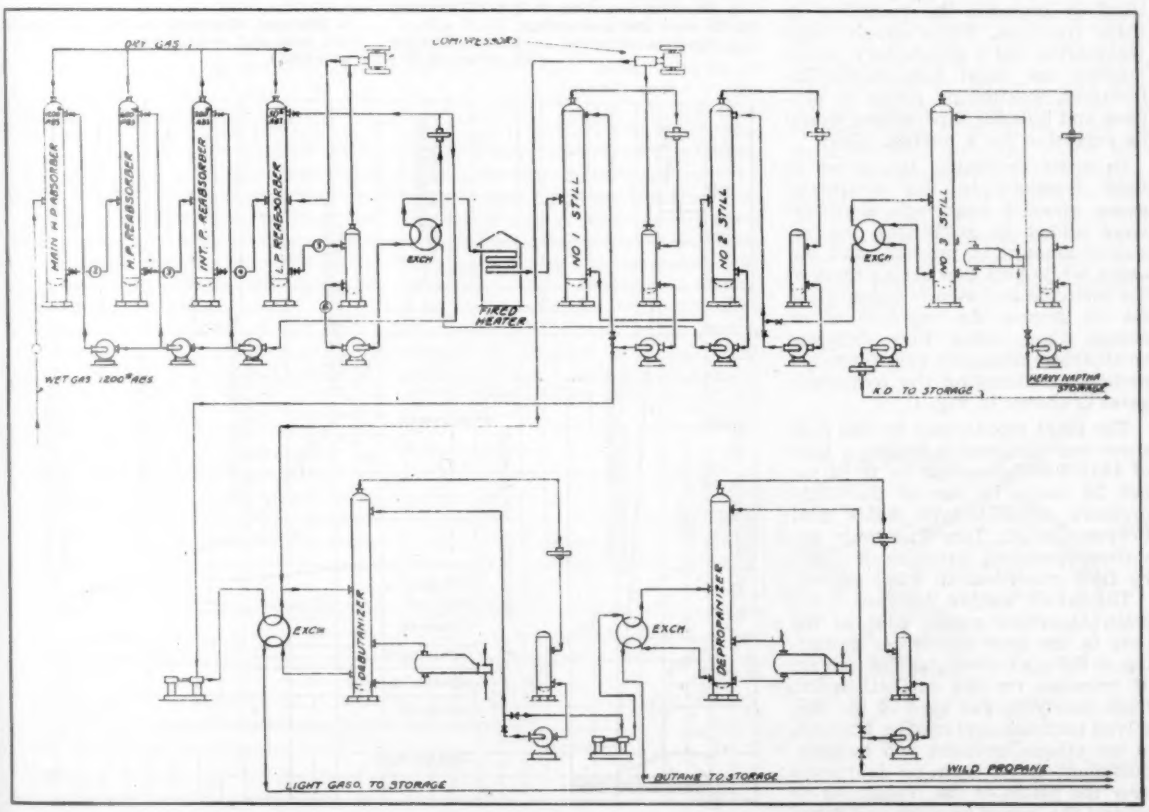


Fig. 1

gage, and the saturated oil was weathered first at 250 p.s.i. and then at 35 p.s.i. This required pumping the fat oil from the low-pressure weathering tank in order to deliver it through the heat exchangers and preheaters into the still, which operated at about 40 p.s.i. gage. However, the cost of pumping was justified by the reduction in gasoline losses achieved by the two-stage weathering. More than half of the methane was weathered out in the high stage, but on account of the high pressure in this stage the amount of gasoline fractions carried away by the weathered gas was small. In the low-pressure stage the gasoline richness of the weathered gas was appreciable, but its volume was so greatly reduced by the previous high-pressure weathering that the actual gasoline loss was still permissibly small. In this plant the weathered gas was used partly for fuel, and the remainder was compressed and discharged to the absorber outlet header for delivery into the pipe line. The initial high-pressure weathering effected an important saving in the required compressor horsepower, since this part of the gas needed to be compressed through only one stage.

As emphasis on the recovery of propane and butanes has increased, the simple two-stage weathering system just described has been modified to improve the retention of these fractions. While simple stage weathering did a satisfactory job of holding the usual natural-gasoline fractions, weathering losses of propane and butanes it permitted would be excessive for a modern plant.

In order to control the losses of light fractions in the weathered gases, about 5 years ago absorbers were added to hold back the required amount of propane and butanes while still permitting most of the methane and ethane to leave the fat oil stream. An example of an actual plant using four different weathering pressures with three absorbers for handling the weathered gases is shown in Fig. 1.

The plant represented by this flow sheet was designed to handle a total of 120,000,000 standard cu. ft. of gas per 24 hours in one of the high-pressure distillate-type fields near Corpus Christi, Tex. The main absorber operating pressure is fixed by field conditions at 1,200 p.s.i.

The fat oil leaving the base of the main absorbers passes first to the base of the first reabsorber operating at 600 p.s.i. absolute. The release of pressure on the fat oil stream frees nearly 50 per cent of the dissolved methane, and smaller amounts of the ethane, propane and butanes. Sufficient fresh lean oil is passed over the plates of the reabsorber to control the loss of propane and heavier components as desired.

The combined stream of fat oil from the base of the 600-lb. reabsorber is then passed to the intermediate pressure reabsorber operating at 200 lb. absolute, where the vented gas is again treated with a stream of fresh absorber oil.

The fat oil from the base of the intermediate reabsorber is then passed to the base of the low-pressure reabsorber operating at 50 lb. absolute, and the vented gas is absorbed with another stream of fresh absorber oil.

In order to retain the maximum amount of propane, it is necessary to reduct the amount of methane and ethane enough to permit total condensation of overhead vapors in the depropanizer column, thus avoiding any loss of propane from the materials in the fat-oil stream after leaving the last venting stage. In the case of the plant under discussion, this requirement made it necessary to put the absorber oil through one more stage of venting, at 16 lb. absolute or about 1 lb. gage. Instead of attempting to efficiently extract the propane and heavier from the vented gases in this stage at this pressure, it proved to be more economical to compress these gases and introduce them into the base of the low-pressure reabsorber. By this four-stage system of venting, it was possible to so far reduce the methane and ethane to be distilled out of the fat oil as to allow total condensation in the depropanizer column reflux condenser without operating it at an abnormal pressure.

The rest of the flow sheet is conventional except that three stills are provided to permit making three separate primary products; namely, wild light gasoline containing all the propane and butanes, heavy

TABLE 1

	1		2		3		4		5	6	
Component	Mols	Mol (%)	Mols	Extr. (%)	Mols	Extr. (%)	Mols	Extr. (%)	Mols	Mols	Extr. (%)
Methane ..	293,783	92.77	15,600	5.3	8,151	2.8	2,496	0.85	497	58	0.02
Ethane	9,944	3.14	2,148	21.6	1,875	18.9	1,423	14.3	1,039	488	4.9
Propane ..	4,434	1.40	2,240	50.5	2,167	48.9	2,037	46.0	2,252	1,696	38.2
I-Butane ..	1,425	0.45	1,230	86.3	1,223	85.9	1,212	85.0	1,374	1,206	84.6
N-Butane .	1,552	0.49	1,497	96.5	1,494	96.3	1,490	96.0	1,647	1,490	96.0
Pentanes ..	1,584	0.50	1,584	100.0	1,584	100.0	1,584	100.0	1,666	1,584	100.0
Hexanes + .	3,958	1.25	3,958	100.0	3,958	100.0	3,958	100.0	3,974	3,958	100.0
Total	316,680	100.00	28,257		20,453		14,200		12,449	10,480	

1. Wet gas entering plant.
2. Material absorbed in fat oil leaving 1,200-lb. absorbers.
3. Material absorbed in fat oil leaving 600-lb. vent and reabsorber.
4. Material absorbed in fat oil leaving 200-lb. vent and reabsorber.
5. Material absorbed in fat oil leaving 50-lb. vent and reabsorber (including recycle).
6. Material absorbed in fat oil leaving 16-lb. vent and reabsorber.

(All pressures in p.s.i. absolute.)

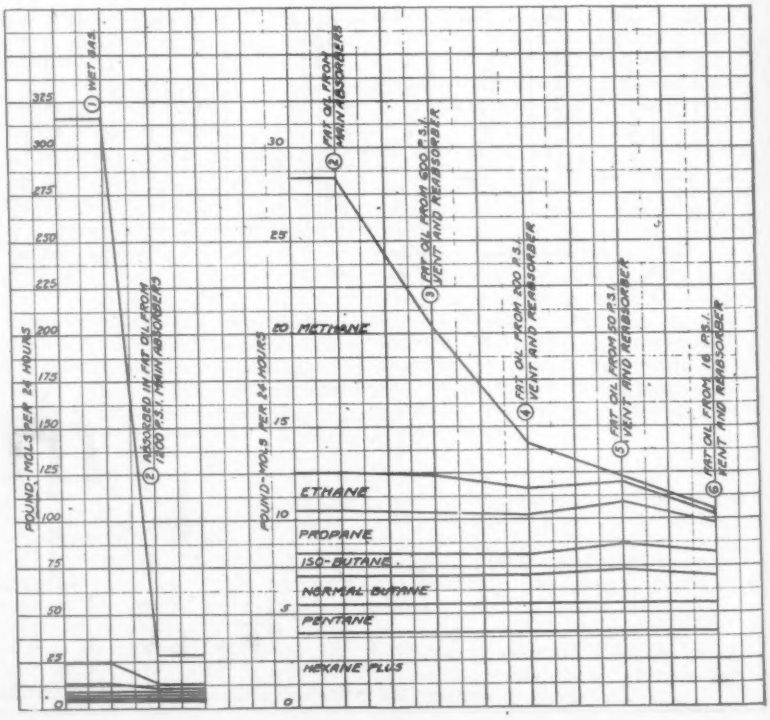

① WET GAS
② ABSORBED IN FAT OIL FROM 1,200 P.S.I. MAIN ABSORBERS
② FAT OIL FROM MAIN ABSORBERS
③ FAT OIL FROM 600 P.S.I. VENT AND REABSORBER
④ FAT OIL FROM 200 P.S.I. VENT AND REABSORBER
⑤ FAT OIL FROM 50 P.S.I. VENT AND REABSORBER
⑥ FAT OIL FROM 16 P.S.I. VENT AND REABSORBER
POUND-MOLS PER 24 HOURS
METHANE
ETHANE
PROPANE
ISO-BUTANE
NORMAL BUTANE
PENTANE
HEXANE PLUS

Fig. 2

naphtha, and specification kerosene.

In the lower part of the diagram, the raw light gasoline plus the recompressed vapors from the No. 1 still condensate accumulator are fractionated into debutanized light gasoline, mixed butanes, and wild liquid propane containing some methane and ethane.

Fig. 2 shows in graphical form the results accomplished by the absorption and weathering system. The column of figures at the left of the graph shows the composition of the wet gas entering the base of the absorber. Actually, a considerable amount of heavy distillate is condensed in the gas before it enters the absorber. The composition shown includes this condensed material along with the vapor-phase components. The actual quantities entering the plant are 1,000 times as great as those indicated on the graph scales. The graphs show the components in their natural order. Thus the space between the uppermost line and the next lower indicates the relative amount of methane; that between the second and third lines, the amount of ethane; and so on for each component down to the lowest graph. The space between the lowest graph and the base line indicates the amount of hexanes and heavier.

The effect of the primary absorption is shown in the left-hand part of the graph. In this absorption about 5 per cent of the methane in the wet gas is dissolved in the absorber oil, 22 per cent of the ethane, 51 per cent of the propane, 86 per cent of the isobutane, 97 per cent of the normal butane and 100 per cent of the pentanes and heavier. This part of the graph shows clearly the highly selective nature of the absorption process. Almost 100 per cent of the isobutane and heavier is captured in the absorber oil, while only a very small part of the methane and ethane is held.

The right-hand part of the graph is drawn to a scale 10 times as large as the primary absorption, in order to show more clearly the changes which occur during the four-stage weathering process just described.

Of the materials dissolved in the oil by the primary extraction, the following approximate percentages remain in the combined fat oil leaving the base of the 600 lb. reabsorber:

Component—	% Original Extraction Remaining
Methane	53%
Ethane	87
Propane	97
I-Butane	99.5
N-Butane	99.8
Pentanes +	100.0

Similar reductions in the lighter components continue through the remaining three weathering stages as shown on the graph. In the final result, the fat oil entering the distillation system shows the following relative amounts of dissolved materials as compared with those same materials in the fat oil stream leaving the base of the primary absorbers:

Component—	% Original Extraction Remaining
Methane	0.38%
Ethane	22.7
Propane	75.6
I-Butane	98.0
N-Butane	99.5
Pentanes +	100.0

(The actual figures at each step in the weathering and reabsorption process are given in Table 1.)

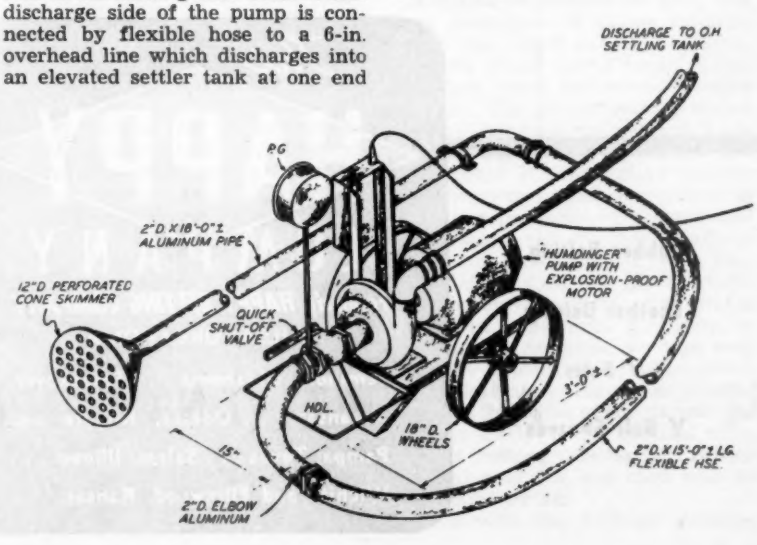
The remarkable selectivity of this combination of multi-stage weathering with reabsorption is emphasized by the table above, showing the percentage of original extraction remaining in the fat oil after the last (16 p.s.i. absolute) venting. While over 75 per cent of the propane originally extracted is retained, and substantially 100 per cent of the isobutane and heavier, only a little over one-third of 1 per cent of the methane originally absorbed must be dealt with in the subsequent distillation and fractionation steps.

The increase in the quantity of dissolved materials indicated at Station (5) "Fat Oil From 50-lb. Vent and Reabsorber" shows the effect of recycling the gas vented at 16 lb. absolute pressure and returned by compression to the 50-lb. reabsorber. The effect of this recycle, of course, disappears in the oil leaving the 16-lb. absolute vent, so that here all components down to normal butane show a decline as compared with the quantities leaving the 200-lb. vent.

Pump Removes Collector-Settler Tank Sediment

FOR removing sediment from the collector-settler tanks in the refinery waste-oil-recovery system a "Humdinger" centrifugal pump is mounted on a carriage of two wheels, and is attached directly to an electric motor with switch box fastened on the side of the housing. The motor is explosion proof, 3 hp., and operates at 3,400 r.p.m. To the pump inlet port a 2-in. pipe is fitted, bent to a right-angle turn in a short curve, and fitted with a pressure gage. A quick shut-off valve is also fitted. A 20-ft. length of 2-in. flexible hose is attached to the upper end of a 15-ft. section of 2-in. aluminum pipe (aluminum used only for light weight and easy handling). To the lower end of this pipe is fitted a perforated, flat-cone-shaped skimmer head 12 in. in diameter. This aluminum pipe extends to within 1 in. of the settling-tank bottom. The discharge side of the pump is connected by flexible hose to a 6-in. overhead line which discharges into an elevated settler tank at one end of the separator. A ½-in. steam line extends a short distance into the riser of this 6-in. discharge line, to jet steam into this section to aid the lifting of the material to the horizontal section of the discharge line.

In operation the aluminum head is lowered to near the tank bottom and the pump motor started. Priming is continuous. Sediment is picked up from the tank bottom and passes through the pump into the discharge line and into the settling tank from which liquids drain away to the settlers below. The quick-throw reversing valve near the pump inlet is for the purpose of reversing the suction on the intake skimmer head to free it of any material which cannot pass the holes in the head. The pump can handle any object which passes these approximately 1-in. holes.



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Diamond Chain Transmission and Timken Bearings for Happy Unit Pumpers were adopted after thorough investigation and examination of transmission methods utilized for oil field pumping. Widespread performance throughout the oil country over a number of years is testimony of the important part these factors play in assuring adaptability, efficiency, economy and endurance.

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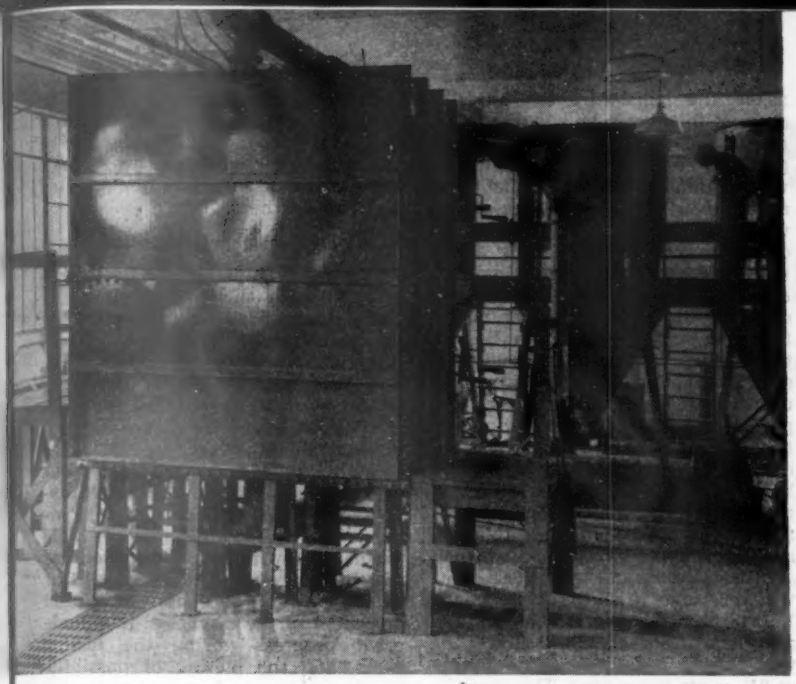


Pilot plant for acetylene from methane: discharge chamber

New Products Developed From Natural Gas

by E. P. Schoch

METHANE is the main ingredient of gas. In weight and fuel value it amounts to seven times as much as the higher hydrocarbons or liquefiable components in natural gas, and our known gas reserves contain an amount of methane equal in weight to our known liquid-petroleum reserves.

At present, the condensates abstracted from gas are the only gas ingredients used for making aviation gasoline and chemicals, but they are consumed at a greater rate than the methane. This is because 600,000,000,000 cu. ft. of dry gas are now replaced annually in the ground after abstracting 14,000,000 bbl. of condensates from them. Since these 14,000,000 bbl. of condensates are 30 per cent of the total natural gasoline produced, and since the "dry" gas is saved for future use, it follows that the methane will last much longer than these valuable condensates. Hence a process of converting methane to higher hydrocarbons will be needed.

Methane is, chemically, very inert or stable. No method is now known by means of which liquid hydrocarbons can be synthesized directly from it. An indirect process for making liquid hydrocarbons from methane was developed by Franz Fischer and H. Tropsch in Germany, and consists of the action of hydrogen on carbon monoxide. In order to use methane for this purpose, it is first decomposed to carbon monoxide and hydrogen by means of either steam or carbon dioxide. But the latter can be made direct from coke and steam, and hence methane is not really needed or used for the process.

The use of methane for the production of wood alcohol and formaldehyde also involves its primary change to carbon monoxide; and the only other chemical products now made—namely, the nitromethanes, and chloroform, carbon tetrachloride, etc.—are all merely substitution products of methane.

The direct coupling of two or more hydrocarbon radicals from methane requires the addition of energy. If this energy is to be added in the form of heat, then the temperature must be very high and the time of exposure very short—a small fraction of a second. This imposes difficulties which do not appear to have been overcome successfully.

Practicality of Process

In 1929 the writer undertook to use electric discharges through gases for adding the energy required to couple up hydrocarbon radicals from methane. To date this effort has resulted in a process of making acetylene from natural gas. This process is perfectly practicable and economical even though no commercial installation of it has been built so far, due to war conditions which prevented the use of the materials needed for the installations.

Theoretically, it is possible to make many valuable products from methane by means of electric discharges through gases, but it is a question whether they can be made economically. Work is now in progress to determine such possibilities.

It should be pointed out here that it is important to make valuable rather than cheap products—that is, products which add a large manufacturing value per pound of raw material. The importance of a raw material naturally increases as more of the high-valued products are made from it. Thus clays become more important as more and more of the finer products—chinaware and art ware,—rather than common bricks are made from it. With coal tar, it is the dyes and pharmaceuticals rather than tar roofing which give it its importance. Similarly, in dealing with methane, we must seek to make plastics and rubber rather than gasoline—because in making gasoline the value of the natural gas used is likely to be doubled only, but in making plastics or rubber the value of the gas used will be multiplied by 40.

It is with the view of devising

E. P. Schoch has been director of the Bureau of Industrial Chemistry, Texas University, since 1914. He was granted the C. E. and M. A. degrees from the University of Texas in 1894 and 1896; he followed with the Ph.D. from University of Chicago in 1902; was professor of physical chemistry at Texas University, 1911-1940. Since 1929 he has devoted his major energies to conversion of natural gas—methane—to industrial and commercial products, particularly those discussed in the accompanying article, acetylene, butadiene, olefins and diolefins, etc., from methane via the electric discharge.

The article presented here is an interesting report of progress of the researches undertaken and prosecuted by University of Texas scientists and engineers to develop methods for more efficient utilization of the vast hydrocarbon gas reserves of that state. The author here outlines the work being done and some of the results to date.

profitable processes that this work is being carried on.

Possible Tonnage and Value of Chemical Products

To illustrate the possible tonnage and financial value of such chemical manufactures, we present the following concerning acetylene. Other products such as ethylene would show similar pictures.

Heretofore, acetylene has been made exclusively from calcium carbide. The latter is made by smelting lime with coke in an electric furnace. Until 1910, acetylene was used solely as a fuel gas. By 1920, it was used extensively for making acetic acid; its annual production in the United States rose from 5,000 tons in 1914 to 11,000 tons in 1922, and then to 183,750 tons in 1943. Its present production in Europe is probably more than three times as great. While an essential fraction of this acetylene is used for welding, yet the greater amount is used for making plastics, rubber, and chemicals. In 1942, the amounts of acetylene used for the respective products have been estimated to be as follows:

Acetylene used—	Amount (tons)
For acetic acid	66,000
For vinyl chloride and vinyl polymers	4,000
For neoprene rubber	30,000
For chlorinated solvents	22,500
For welding	61,250
Total	183,750

The production of "carbide" is now taxing the established plants to the utmost, and at the end of the war there will be a large increase in demand for acetylene.

The average weight of the products made from acetylene is about twice as much as that of the acetylene itself; and the average price of the product (plastic) is about 40 cents per pound. Hence, a production of 100,000 tons of acetylene from natural gas in Texas would produce products worth $80,000,000, and this would be made from about 20,000,000,000 cu. ft. of gas which is used partly as raw material, and partly as fuel. This gas—at 10 cents per 1,000 cu. ft.—would bring $2,000,000 to the gas-well owners, and produce a 40-fold increase in value due to manufacturing. This is a conservative estimate.

Possibilities of the Electric Discharge Process

It is risky to dwell on the possibilities of this electric discharge process. However, without some definite forecast of possibilities the impression may be gained that the writer is dubious about its possibilities—and this is certainly not the case. Hence, the following remarks are ventured.

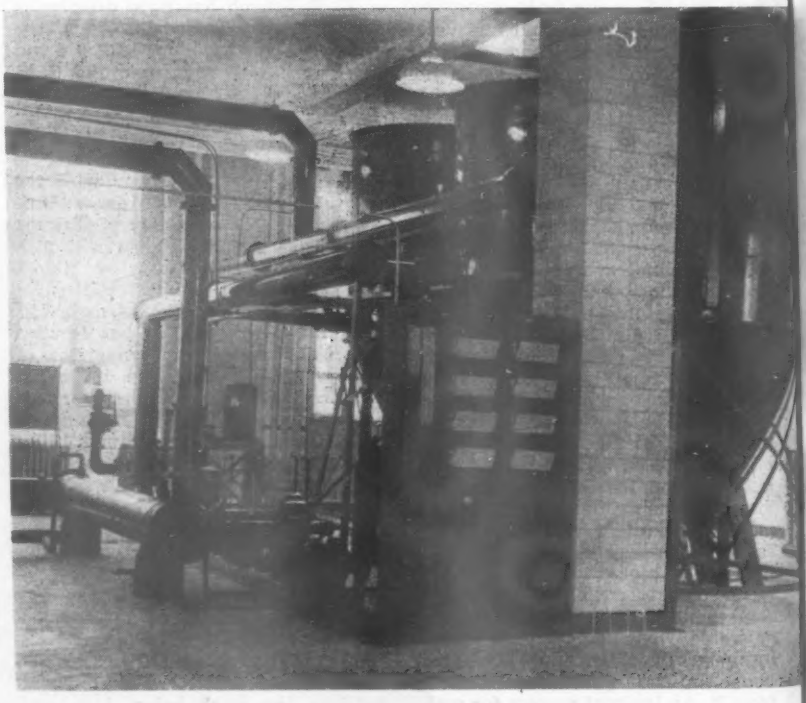
When, in 1937, the writer first asked the legislature for funds to support this work, he suggested that a sum of $50,000 per annum be granted; but only one-fourth of this was obtained. At that time when asked about the possibilities of this work, he predicted that we might obtain a process for making acetylene, and use this for making rubber, and that within 5 years, we could be the greatest rubber manufacturing state in the Union. He was then smiled at for this prediction; still it happened to come true. But unfortunately we did not have this process developed far enough at the time of Pearl Harbor to have it included in the rubber program. To how near we were, it should be said that Governor Stephenson gave us $35,000 to hurry our investigation, and the University regents furnished another $40,000, and with these sums we were able to show by February 1, 1943, that our process could make acetylene from methane and convert this to butadiene and sell this at 9½ cents per pound. The prevailing cost of this made by other processes and from other sources has been near 20 cents a pound. Since war conditions made it impossible to obtain priorities to build a plant, it will not be until after the war that our acetylene process can be used. Had we been given the money asked for in 1937, we could have been in production before Pearl Harbor.

As far as acetylene is concerned, our job is nearly done. But we have other jobs to do. Many other products—ethylene, higher olefines, diolefines, aldehydes, ketones, and acids are needed and should be made from methane; and we believe the electric discharge can be adapted to produce them.

Electric Discharge Application

Acetylene is merely the first product to which the new electric discharge was adapted. This was because acetylene requires the highest energy intensity for its production, and the problem which had to be solved was the "taming" of the electric discharge so that it would not be excessively severe.

With further progress of our knowledge of this operation, we expect to tame the discharge very much more, and thus may be able to make a whole host of products which require mild "activation." Our whole concept of shape, size, and operation of the discharge has made great progress during the last 2 years, and the picture of possibilities has progressed correspondingly. When, in May 1943, Dr. A. M. McAfee, of Gulf Refining Co., told Governor Stephenson, in the presence of the university board of regents and others, that, in his opinion, this process would become as important to the oil and gas industry during the next decade as the oil-cracking process was during the last decade it may have been considered by some that he was taking a big chance, but the progress of this work is now such as to support his prediction more and more firmly.



Pilot plant for acetylene from methane: carbon filters

Resaturate While Repressuring —A Wartime Suggestion

*by Frederick Squires**

GAS-REPRESSURED properties are apt to develop the undesirable characteristic that certain input wells may provide too ready a passage for gas to neighboring output wells to the detriment of their oil production.

The writer long ago came to the conclusion that the cause of this phenomenon lay in the reduction of the percentage of the liquid content of the sand between such input and output wells and this belief has been fortified by recent laboratory investigations.[1]

*Petroleum Engineer, Illinois State Geological Survey. Article published by permission of the chief, Illinois Geological Survey.

1. (a) Wyckoff, R. D., and Botset, H. D., The Flow of Gas-Liquid Mixtures Through Unconsolidated Sands.

(b) Leverett, M. C., and Lewis, W. B., Steady Flow of Gas-Oil-Liquid Mixtures Through Unconsolidated Sands. Trans. A.I.M.E. (Petroleum Development and Technology) vol. 142, 1941, p. 107.

(c) Dickey, Parke A., and Bossler, Robert B., Role of Connate Water in Secondary Recovery of Oil. Trans. A.I.M.E. (Petroleum Development and Technology) vol. 155, 1944, p. 175.

(d) Dickey, Parke A., Influence of Fluid Saturation in Secondary Recovery of Oil: (Pt. II, sec. 4), Proceedings Am. Petr. Inst., vol. 24 (IV) 1944, p. 158.

The present paper is intended to show how the rules developed for the relation between the degree of liquid saturation and the amount of liquid movement, may be applied to improve oil production in repressured areas. "Blowing through" may be reduced by adding water through the gas input wells in quantities sufficient to increase the liquid content of the sand to the point at which, when gas injection is resumed, the permeability of the sand to gas is reduced and gas reacquires its ability to move oil.

Laboratory Investigations

Experiments have proved in laboratory tests that when a gas and a liquid flow simultaneously through a sand, the permeability to gas increases as the liquid saturation decreases and vice versa. As interpreted by Parke A. Dickey [ref. 1 (d)] the experiments indicate that:

"That injected gas-oil ratio varies geometrically with gas-liquid saturation ratio of the sand. At a liquid saturation of about 80 per cent, the gas-oil ratio will be about 5 cu. ft. per barrel, whereas at a liquid saturation of about 60 per cent, the gas-oil ratio will be about 5,000 cu. ft. per barrel.

"It makes very little difference whether the liquid is water or oil. Consequently, if the liquid were all oil, practically none would be recovered even if the saturation were 30 per cent. If the liquid saturation was 60 per cent, of which 30 per cent was oil and 30 per cent was water, considerable quantities (of oil) could be recovered at reasonable injected gas-oil ratios. If the liquid was 70 per cent, of which 40 per cent was water and 30 per cent was

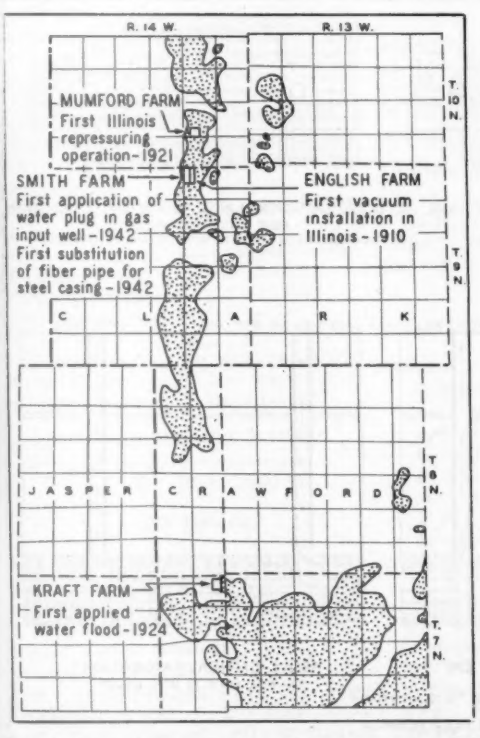


Fig. 1: Map showing location of resaturating experiment. It also shows the initial applications in the state of repressuring, flooding, and nonferrous well casing, these being the work of the author

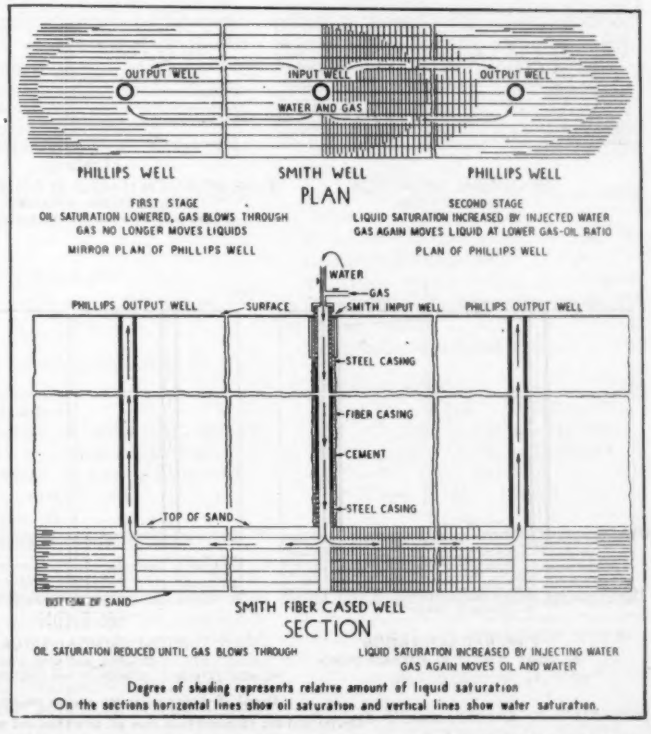


Fig. 2: Diagram illustrating the process of resaturating to correct the evil of blowing through. Smith-Phillips wells in W½ NW 2-9n-12w, Johnson Township, Clark County, Illinois

oil, the oil could be recovered at still better gas-oil ratios."

Application of Laboratory Findings to Correction of Blowing Through

Many sands, such as the Cow Run in southeastern Ohio and the adjoining fields in West Virginia, have high but irregular permeabilities and produce little water. They are vulnerable to the well-known evil of "blowing through" or "bypassing" wherein gas finds the easiest channel between an input and one but not all of its surrounding output wells, quickly reduces the intervening saturation to submarginal proportions and no longer moves oil to any of the surrounding output wells, even with enormous gas throughput. The pressure medium has followed an excessively permeable channel which was, of course, quickly flushed of most of its oil and has therefore become tremendously permeable to gas. To correct this, water may be injected through the gas-input well from which most of it will occupy the most permeable sand. The result is an increase in the fluid saturation to the point at which it is less permeable to gas, the degree being determined by the amount of water. Some of the injected gas then moves to others of the surrounding outputs as well as through normally less permeable horizons of sand between the wells formerly blowing through. This is the simplest form of selective plugging. It may be, but does not often need to be, refined by adding any of the well-known plugging agents. The process is cheap and can do the well no harm. The Dinsmoor brothers were the first to practice this water plug.

Application of Laboratory Findings to Oil Production in the Field

On many properties, especially those that produce little water, after repressuring operations have been carried on for a long time, the percentage of liquid saturation between many input and output wells scattered throughout the area falls to a point at which little oil is moved, even by constantly increasing volumes of injected gas. The liquid content in the area traversed by the gas has fallen below Dickey's critical per cent of the sand-pore space. Its permeability to gas has been so increased that in effect the whole field is "blowing through" even though some of the wells still offer resistance. Since no more oil can be moved by injected gas at the existing liquid saturation of the depleted areas and since oil would be moved elsewhere in the liquid saturation was raised in the too permeable horizons, then both laboratory experiment and field experience dictate that water should be introduced from the surface into the offending wells to provide enough resistance for oil to be again gas movable. This was recognized by the writer as a rule of thumb rather than a law of science in 1917 in patent No. 1,249,232, claims 3 of which reads: "The method of recovering oil and gas which consists in introducing into the oil-bearing stratum a gas under pressure and introducing, simultaneously with the gas, a liquid under pressure."

A Field Test in Illinois

Fig. 1 is a map of an area in Illinois which is historic ground because here is located the English farm, Illinois' first vacuum application; the Mumford farm, the first Illinois repressuring operation; the Kraft, the first intentional water flooding in the state; and the Smith farm, the first property in Illinois on which water injection intermittent with gas was used to correct blowing through, and the first installation of fiber pipe as a substitute for steel casing.

Vacuum was applied by Harry Werts on the English farm and accomplished large oil-production increase. The magnitude of the results caused operators to adopt the process generally, although many applications were not profitable.

The first successful repressuring operation in the state was applied

(Continued on page 75)

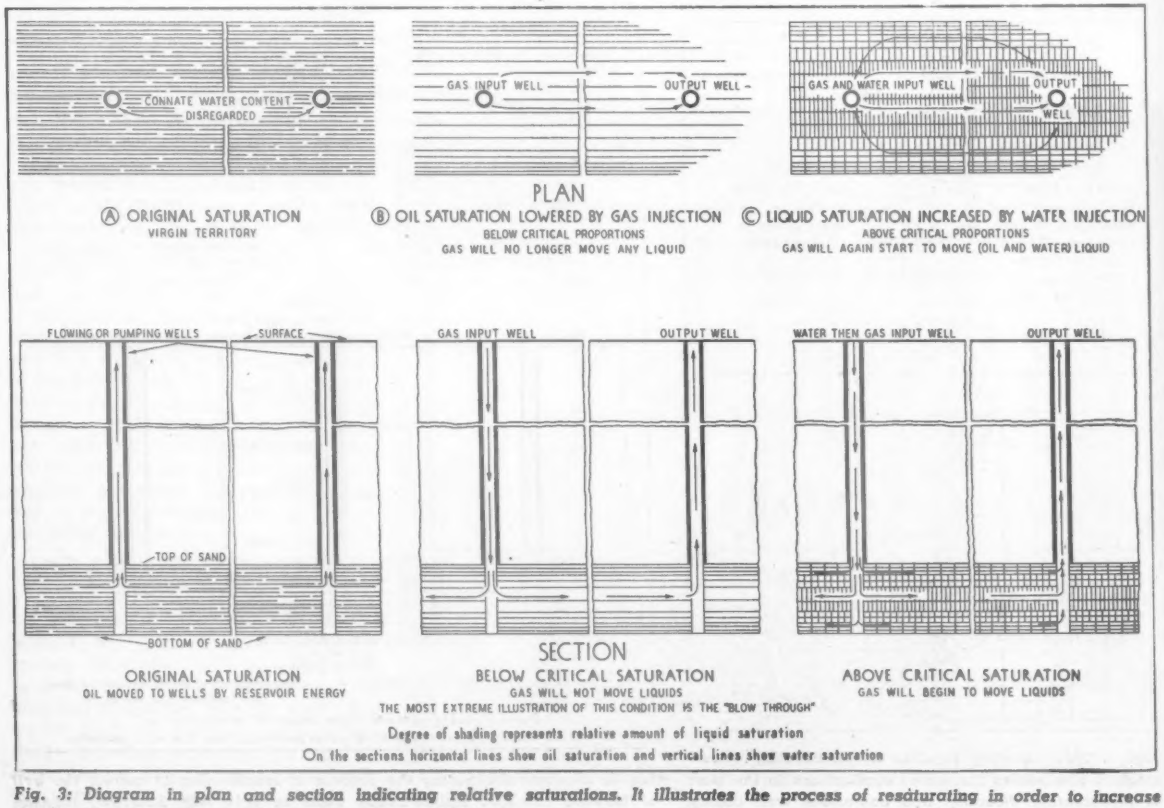

CONNATE WATER CONTENT DISREGARDED
GAS INPUT WELL
OUTPUT WELL
GAS AND WATER INPUT WELL
OUTPUT WELL
PLAN
Ⓐ ORIGINAL SATURATION
VIRGIN TERRITORY
Ⓑ OIL SATURATION LOWERED BY GAS INJECTION
BELOW CRITICAL PROPORTIONS
GAS WILL NO LONGER MOVE ANY LIQUID
Ⓒ LIQUID SATURATION INCREASED BY WATER INJECTION
ABOVE CRITICAL PROPORTIONS
GAS WILL AGAIN START TO MOVE (OIL AND WATER) LIQUID
FLOWING OR PUMPING WELLS
SURFACE
TOP OF SAND
BOTTOM OF SAND
GAS INPUT WELL
OUTPUT WELL
WATER THEN GAS INPUT WELL
OUTPUT WELL
SECTION
ORIGINAL SATURATION
OIL MOVED TO WELLS BY RESERVOIR ENERGY
BELOW CRITICAL SATURATION
GAS WILL NOT MOVE LIQUIDS
THE MOST EXTREME ILLUSTRATION OF THIS CONDITION IS THE "BLOW THROUGH"
ABOVE CRITICAL SATURATION
GAS WILL BEGIN TO MOVE LIQUIDS
Degree of shading represents relative amount of liquid saturation
On the sections horizontal lines show oil saturation and vertical lines show water saturation

Fig. 3: Diagram in plan and section indicating relative saturations. It illustrates the process of resaturating in order to increase the liquid content of a sand from the point at which gas ceases to move liquid to a proportion at which gas is again effective

Applications of Darcy's Law

*by Park J. Jones**

Mechanics of Producing Oil, Condensate, and Natural Gas

PART 19 OF A SERIES

Darcy's law is reviewed and illustrated by examples of oil and gas displacement in reservoirs and into wells. Linear, radial, and semispherical displacements are illustrated by examples. Darcy's law for linear displacement is used for estimating the rate of migration of oil or gas across a lease or from one portion of a reservoir to another. Darcy's law for radial displacement is used for estimating the productivity of oil, condensate, and gas wells. Darcy's law for semispherical displacement is used for estimating the rate of oil or gas displacement into wells which do not penetrate their entire pay thicknesses.

Oil and gas pays contain interstitial water. The permeability of a pay to a reservoir liquid or gas is called effective permeability. The effective permeability with water either a reservoir liquid or gas may be less than the permeability of the pay. Water tends to reduce effective permeability. The variation of effective permeability of a pay to saturation will be considered later. In this article the phrase "effective permeability" is used to signify that the influence of interstitial water on the permeability of pay to reservoir fluids was accounted for. Aside from interstitial water, this article is limited to homogeneous reservoir fluids, that is, to either a reservoir liquid or a gas. Displacement into a well is exclusive of any pressure drop because of mud on the face of a well bore or cement liner, or casing in a well.

Linear Displacement of Reservoir Liquids

DARCY'S law for linear displacement of reservoir liquids may be stated as follows:

$$Q = 1.127 \frac{AK\Delta P}{\mu b L} \qquad (1)$$

where

- Q = rate of displacement, bbl. of oil/day
- A = area, sq. ft.
- K = effective permeability, darcys
- μ = viscosity of reservoir liquid, centipoises
- b = volume factor, bbl. of space per bbl. of oil
- $\Delta P/L$ = pressure difference across distance L, p.s.i./ft.

Darcy's law as defined by Equation 1 is valid provided both the area and effective permeability are the same in all sections at right angles to the direction of displacement. A derivation of this equation was given in Part 5 of this series.

Illustrative Example 1

At what rate is oil migrating across a lease under the following conditions?:

Length of lease = 3,960 ft.
Width of lease = 1,320 ft.
Pay thickness = 40 ft.
Effective permeability = 600 md.
Viscosity of reservoir liquid = 2.0 centipoises.
Pressure difference across length of lease = 100 p.s.i.
Pressure difference across width of lease, none.
Volume factor = 1.2 bbl./bbl.
No production from lease.

In this example the area is 1,320 × 40 or 52,800 sq. ft. So, the rate of oil displacement is defined by:

$$Q = 1.127 \frac{52{,}800 \times 0.6 \times 100}{2 \times 1.2 \times 3.960}$$

$$= 376 \text{ bbl./day}$$

The corresponding rate of reservoir liquid migration is 376 × 1.2 or 451 bbl./day.

If the pay thickness in this example varied uniformly from 40 ft. at one end to 20 ft. at the other end, the corresponding average pay thickness is (40 + 20)/2 or 30 ft. and the rate of oil migration (30/40) (376) or 282 bbl./day.

If the effective permeability varied uniformly from 600 md. at one end to 1,200 md. at the other end, the corresponding average permeability is 900 md. and the rate of oil migration (900/600) (376) or 564 bbl./day.

Linear Displacement of Reservoir Gases

Darcy's law for linear displacement of reservoir gas may be stated as follows:

$$Q = \frac{112\,AK\,(P_1^2 - P_2^2)}{\mu L T Z} \qquad (2)$$

where

- Q = rate of displacement, cu. ft./day
- A = area, sq. ft.
- K = effective permeability, darcys
- P_1 and P_2 = pressure, p.s.i.a.
- μ = viscosity of gas, centipoises
- T = temperature, °R
- L = length, ft.
- Z = compressibility factor

Darcy's law as defined by Equation 2 is valid provided both the area and the effective permeability are the same in all sections at right angles to the direction of displacement. A derivation of Equation 2 is given in the appendix to this article.

Illustrative Example 2

At what rate is gas migrating across a lease under the following conditions?

Length of lease = 2,640 ft.
Width of lease = 1,320 ft.
Pay thickness = 60 ft.
Effective permeability = 500 md.
Reservoir pressure at one end of lease = 3,000 p.s.i.a.
Reservoir pressure at other end of lease = 3,050 p.s.i.a.
Reservoir temperature = 160° F.
Compressibility factor = 0.9.
Viscosity of gas = 0.03 centipoises.
Pressure difference across width of lease, none.
No production from lease.

In this example:

$A = 60 \times 1{,}320 = 79{,}200$ sq. ft.
$P_1^2 = 3{,}100 \times 3{,}100 = 9{,}610{,}000$
$P_2^2 = 3{,}050 \times 3{,}050 = 9{,}302{,}500$
$P_1^2 - P_2^2 = 307{,}500$
$T = 460 + 160 = 620°$ R

So the rate of gas displacement is defined by:

$$Q = \frac{112 \times 79{,}200 \times 0.5 \times 307{,}500}{0.03 \times 2{,}640 \times 620 \times 0.9}$$

$$= 30{,}750{,}000 \text{ cu. ft./day}$$

Radial Displacement of Reservoir Liquids

Darcy's law for radial displace-

*Production consultant, Houston.

ment of reservoir liquids may be stated as follows:

$$Q = \frac{3.07\ Kh\ \Delta P}{\mu\ b \log R/r} \qquad (3)$$

where

Q = rate of displacement, bbl. oil/day
h = pay thickness, ft.
μ = viscosity, centipoises
b = volume factor, bbl./bbl.
r = radius of well bore, ft.
R = distance from well bore to ultimate source of liquid, ft.
ΔP = pressure difference or drawdown, p.s.i.
K = permeability, darcys

Equation 3 does not account for any production by the expansion of reservoir liquids which accompanies a drawdown. The foregoing equation is derived in the appendix to this article. The effect of mud on the face of a well bore and of pressure drop across a liner or perforations are excluded in Equation 3.

Illustrative Example 3

What is the rate of oil production into a well under the following conditions?

Pay thickness = 40 ft.
Drawdown = 100 p.s.i.
Permeability = 400 md.
Viscosity of reservoir liquid = 0.8 centipoises.
Volume factor = 1.3 bbl./bbl.
Half the distance between wells = 660 ft.
Diameter of well bore = 6 in.

In this example:

R/r = 660/¼ = 2,640
log 2,640 = 3.42

Accordingly, the rate of displacement of oil into the well is:

$$Q = \frac{3.07 \times 0.4 \times 40 \times 100}{0.8 \times 1.3 \times 3.42}$$

$$= 1{,}380 \text{ bbl./day}$$

The corresponding rate of reservoir liquid displacement is 1,380 × 1.3 or 1,800 bbl./day.

Radial Displacement of Reservoir Gas

Darcy's law for radial displacement of reservoir gas may be stated as follows:

$$Q = \frac{305\ hK\ (P_R^2 - P_r^2)}{\mu\ T\ Z \log R/r} \qquad (4)$$

where

Q = rate of gas displacement, cu. ft./day
h = pay thickness, ft.
K = permeability, darcys
$P_R - P_r$ = drawdown, p.s.i.
R = distance from well bore to ultimate source of gas, ft.
r = radius of well bore, ft.
μ = viscosity of gas, centipoises
T = temperature, °R
Z = compressibility factor

Equation 4 is valid for steady rates of isothermal displacement. For unsteady and nonisothermal conditions the actual rate of displacement is slightly higher. This equation does not account for any production by the expansion of reservoir gas which accompanies a drawdown. Equation 4 is derived in the appendix to this article.

Illustrative Example 4

What is the rate of reservoir gas and condensate production into a well under the following conditions?

Pay thickness = 40 ft.
Permeability = 600 md.
Reservoir temperature = 200° F. = 660° R.
Reservoir pressure = 4,800 p.s.i.a.
Operating bottom-hole pressure = 4,700 p.s.i.a.
Compressibility factor = 1.0.
Diameter of well bore = 8 in.
Distance from well bore to edge water = 3,000 ft.
Condensate content of gas = 50 bbl./million cu. ft.
Viscosity of reservoir gas = 0.10 centipoises.

In this example:

R/r = 3,000/⅓ = 9,000 ft.
log 9,000 = 3.954
P_R^2 = 4,800 × 4,800 = 23,040,000
P_r^2 = 4,700 × 4,700 = 22,090,000
$P_R^2 - P_r^2$ = 950,000

Accordingly, the rate of gas displacement into the well is given by:

$$Q = \frac{305 \times 40 \times 0.6 \times 950{,}000}{0.10 \times 660 \times 1.0 \times 3.954}$$

$$= 26{,}600{,}000 \text{ cu. ft./day}$$

The corresponding rate of condensate production is 50 × 26.6 or 1,330 bbl./day.

Semispherical Displacement of Reservoir Liquids

Darcy's law for semispherical displacement of reservoir liquid is given approximately by:

$$Q = 7.06 \frac{r\ K\ \Delta P}{\mu\ b} \qquad (5)$$

where

Q = rate of oil displacement, bbl./day
r = radius of a well bore, ft.
ΔP = drawdown, p.s.i.
K = vertical permeability, darcys
μ = viscosity of reservoir liquids, centipoises
b = volume factor

Equation 5 is derived in the appendix to this article.

Illustrative Example 5

At what rate can oil be produced by a well drilled just to the top of a pay for the following conditions?

Pay thickness = 50 ft.
Diameter of well bore = 6 in.
Drawdown = 100 p.s.i.
Vertical permeability = 400 md.
Viscosity of reservoir liquid = 2.0 centipoises
Volume factor = 1.2 bbl./bbl.

By Equation 5 the rate of oil displacement into the well is given by:

$$Q = \frac{7.06 \times ¼ \times 0.4 \times 100}{2.0 \times 1.2}$$

$$= 29.4 \text{ bbl./day}$$

Illustrative Example 6

At what rate can oil be produced if in the foregoing example the well had been drilled through the entire 50 ft. of pay, the horizontal permeability is 600 md., and distance to the ultimate source of reservoir liquid is 660 ft.? In this example R/r is 660/¼ or 2,640 ft., and log R/r is 3.42. The corresponding rate of oil displacement is defined by Equation 3 as follows:

$$Q = \frac{3.07 \times 0.6 \times 50 \times 100}{2.0 \times 1.2 \times 3.42}$$

$$= 1{,}120 \text{ bbl./day}$$

Semispherical Displacement of Reservoir Gas

Darcy's law for semispherical displacement of reservoir gas is given approximately by:

$$Q = \frac{702\ rK\ (P_R^2 - P_r^2)}{\mu\ TZ} \qquad (6)$$

where the symbols have the same meaning as in Equation 4. The derivation of the foregoing equation is indicated in the appendix.

Illustrative Example 7

At what rate can gas be produced by a well drilled just to the top of a gas pay for the following conditions?

Pay thickness = 40 ft.
Diameter of well bore = 6 in.
Shut-in pressure opposite the pay = 3,100 p.s.i.a.
Operating bottom-hole pressure = 3,000 p.s.i.a.
Reservoir temperature = 140° F. = 600° R.
Compressibility factor = 0.8.
Vertical permeability = 400 md.
Viscosity of reservoir gas = 0.034.

In this example:

P_R^2 = 3,100 × 3,100 = 9,610,000
P_r^2 = 3,000 × 3,000 = 9,000,000
$P_R^2 - P_r^2$ = 610,000

The rate of gas displacement into the well is given approximately by:

$$Q = \frac{702 \times ¼ \times 0.4 \times 610{,}000}{0.034 \times 600 \times 0.8}$$

$$= 2{,}620{,}000 \text{ cu. ft./day}$$

Illustrative Example 8

At what rate can gas be produced if in the foregoing example the well had been drilled through the entire 40 ft. of pay, the horizontal permeability is 600 md., and the distance to the ultimate source of reservoir gas is 1,320 ft.? In this example R/r is 1,320/¼ or 5,280, and log R/r is 3.72. The corresponding rate of gas displacement is defined by Equation 4 as follows:

$$Q = \frac{305 \times 40 \times 0.6 \times 610{,}000}{0.034 \times 600 \times 0.8 \times 3.72}$$

$$= 73{,}500{,}000 \text{ cu. ft./day}$$

There are numerous other applications of Darcy's law in producing oil, condensate, and gas. Some of the other applications will be considered in later articles.

References

Muskat, M., Flow of Homogeneous Fluids, McGraw-Hill Book Co.

Appendix

If a linear system is producing at a steady rate of Q cubic feet of gas per day measured at standard conditions, then the volume rate through at any pressure P and temperature T is defined by:

$$\frac{14.73\ T\ Z\ Q}{520\ P}$$

By Darcy's law relative to displacement rates expressed in cubic feet per day:

$$\frac{1.127 \times 5.615\ AK}{\mu} \frac{dP}{dx} = \frac{14.73\ T\ Z\ Q}{520\ P}$$

which when integrated between the limits P_1 and P_2 and zero and L gives Equation 2.

In a radial system of thickness h, the cross-sectional area at x feet from the axis of a well bore is $2\pi hx$ and Darcy's law is given by:

$$\int_{P_r}^{P_R} dP = \frac{\mu\ b\ Q}{1.127\ (2\pi hK)} \int_{r}^{R} \frac{dx}{x}$$

$$P_R - P_r = \frac{\mu\ b\ Q}{1.127\ (2\pi hK)} \log_e R/r$$

But $\log_e R/r = 2.3 \log_{10} R/r$, so:

$$Q = \frac{1.127 \times 2 \times 3.14\ hK\ \Delta P}{2.3\ \mu \log R/r}$$

which is Equation 3.

Darcy's law for the displacement of reservoir gas may be obtained by integrating the following expression:

$$\int_{P_r}^{P_R} P\ dP = \frac{14.73\ \mu\ T\ Z\ Q}{1.127 \times 5.615 \times 520\ (2\pi hK)} \int_{r}^{R} \frac{dx}{x}$$

After changing from natural to common logarithms, the result is Equation 4.

Muskat gives the following expression for semispherical displacement of reservoir liquids:

$$Q_s = Q_R\ r/h \log_e R/r$$

where

Q_s = semispherical displacement, bbl./day
Q_R = radial displacement, bbl./day
r = radius of well bore, ft.
R = distance to ultimate source of reservoir liquid, ft.
h = pay thickness, ft.

Accordingly:

$$Q_s = \left(\frac{3.07\ Kh\ \Delta P}{\mu\ b \log R/r}\right) \frac{2.3\ r}{h} \log R/r$$

$$= 7.06 \frac{rK\ \Delta P}{\mu\ b}$$

which is Equation 5.

Similarly, Equation 6 is derived by multiplying Equation 4 by (2.3 r/h) log R/r.

Resaturate While Repressuring

(Continued from page 68)

on the Mumford farm in 1921 using an existing gasoline plant. It is unfortunate that the spread of this very generally profitable process has not extended into the rich Lawrence County fields, especially on the Kirkwood sand. It would be a good war effort now.

Water injected from the surface on the Kraft farm in 1924 was the forerunner of the process of flooding which has recently been applied with marked success in the Siggins, Patoka, and Noble pools and promises to be very valuable in many other areas of the state.

Pioneer Work

The Smith farm was chosen for experiments with fiber casing and for correction of blowing through. The Mumford repressuring, Kraft flooding, and Smith fiber-casing operations were pioneer work done by the writer.

Fig. 2 shows the Smith well and the adjoining Phillips well. Gas introduced through the Smith well soon blew through to the Phillips. To correct this, water was injected into the Smith well to increase the liquid saturation and reduce the permeability to gas between the offending wells and this resulted in a reduction of the gas-oil ratio of the Phillips output well. After the water plug was placed, gas pressure was gradually rebuilt. When the gas-liquid ratio at the Phillips well again increased more water was turned in with a like result. The operation requires a considerable water supply.

The same principle is applicable to any parts of whole properties which have had their sand-pore liquid saturations reduced below the critical limit so that wells blow through. The correction for this condition is illustrated in Fig. 3.

This drawing shows three stages in the liquid saturation of a repressured property between any two adjoining input and output wells where blowing through occurs. (A) The condition in the virgin sand; (B) The blowing-through condition after prolonged passage of gas through the sand from any input to any output well, and (C) the improved state of liquid saturation between offending wells after water has been injected through the gas pressure wells. In the drawing (as also in Fig. 2) the sand is shown as if it were homogeneous. It is to be understood that there would always be variations in vertical and horizontal permeabilities. This would act to make gas move oil in the less-permeable strata after water had increased resistance to it in the most permeable horizon.

Acknowledgments

The writer wishes to thank Parke A. Dickey, A. H. Bell, and Henry Lane for help on this problem.

Treatise on Oil and Gas Migration

The January 1945 issue of the Quarterly, published by Colorado School of Mines, contains "The Migration and Accumulation of Petroleum and Natural Gas" by F. M. Van Tuyl and Ben H. Parker of the Department of Geology of the School of Mines and W. W. Skeeters of Mountain Fuel Supply Co.

The publication comprises 112 pages and includes four illustrations and a bibliography of more than 100 references. Following a discussion of the extent, character, and time of migration, the factors bearing on the problem are analyzed, and the prevailing theories on migration and accumulation are then reviewed and weighed in the light of evidence gleaned from the literature and the opinions of leading petroleum geologists.

The research resulting in the publication was done under the sponsorship of the research committee of the American Association of Petroleum Geologists.

PLANT PRACTICES

Chemical Drum Heater

AS a means of keeping caustic soda fluid when desired in the boiler-water treating system, a rack was made some 18 in. high, of ⅜-in. sheet, about 30 in. by 20 in., welded. The ends of the rack extend 1 ft. above the upper edge of the sides, and half-moons are cut to receive a round drum in horizontal position. Immediately below this drum position is placed a steam heater coil, made by welding in parallel harp-fashion sections of 1-in. pipe to sections of 2-in. pipe as headers. Steam is admitted to this heater harp by welding a threaded nipple into one header, a drain line being welded into the opposite header. Suitable inlet and outlet control valves are installed in these lines. By keeping steam flowing through the heater placed just below the drum, caustic soda or any other material of low melting point but normally solid at room temperature is kept in a fluid condition for use.

Valve Test Stand

ALL valves repaired in the mechanical department shops are tested hydrostatically as shown. The gate and seat rings are carefully machined, then the gate is lapped in place securing a bearing all around. Then, with the valve closed, a test pressure is exerted through a connection to the bonnet which tests both faces of the valve at the same time. Full test pressure equal to 1½ times maximum working pressure is used. When hand pump, shown, is not adequate, a hydraulic steam pump capable of building up 3,000 lb. is employed. The valve must be drop tight for a considerable period of time before it has passed the test. After completion of the test, the pipe connection to bonnet is removed and a ¼-in. pipe plug screwed in place. Repaired valves have the reputation in the refinery of being equal to or better than new valves in tightness.

Barrel Handling Device

GREASE drums weighing about 440 lb. are filled on the first floor of the compound building. They are laid on their sides and rolled to the barrel drop which lowers them to the basement, landing them at the bottom of the barrel drop shaft shown at left in the photograph. They roll out of the shaft on rails so shaped that the center of gravity of the drum follows a downward path. This keeps the drum rolling. One rail follows a pronounced downward path while the other follows an upward path. The result of these paths is to rotate the drum about its center so that it lands on one head on the platform. It has enough momentum to slide off the platform onto the roller conveyor which carries it down the floor to the storage spot. Thus, without manual effort or attention by anyone, the only force being that of gravity, the drums roll out, stand on one end, and roll down the conveyor.

(The ideas described on this page are used in Tide Water Associated Oil Co.'s Bayonne, N. J., refinery.)

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Simplified Flow Diagrams—Phenol Solvent Treating

Can you send us data of the newest improvements in the way of phenol solvent extraction?—A. C. B.

The processing or flow employed in earlier phenol-extraction systems has been altered in the new plant of Kendall Refining Co. (Kenny & McCluer, The Oil and Gas Journal, page 48, January 16, 1941) constructed by M. W. Kellogg Co. in 1940, by utilizing a countercurrent extraction or treating tower and by eliminating water from the troublesome constant-boiling water-phenol mixture by absorbing some of it into the incoming charge stock. The latter is particularly notable because the separation of the 11 per cent phenol 89 per cent water mixture has been difficult. Extract stripper steam and some other vapors, enough to currently eliminate all water from the system, are sent through an absorber held at 225°-245° F. wherein the incoming charge stock absorbs phenol from the stripping steam. Total losses of phenol are said to amount to less than 0.04 per cent of the phenol circulated. Even this small amount is not negligible, amounting to about one-third of a barrel for a circulation of 1,000 bbl. Improvement in viscosity index requires the production of extract material in the amount of about 1 per cent for each increase of one in the viscosity index. At the extremes, a 2 per cent loss to extract for an increase in viscosity index of one occurs with high-viscosity-index stocks whereas for naphthenic stocks the loss to extract may be only 0.5 per cent. The amount of phenol circulated ranges from about one part phenol per one part stock, to as high as 2.5:1 for some naphthenic stocks. The operations (see flow diagram) are:

1. Heated lube stock is used to absorb phenol from steam (mainly from extract and raffinate strippers).

2. Stock is cooled and contacted with phenol in a countercurrent tower which might be called a solvenation operation because of its similarity to fractionation. The bottom of this tower is kept cool with phenolic water and the top is kept warm with hot phenol.

3. The valuable raffinate is heated and flashed at atmospheric pressure and then flows downward into a vacuum fractionation and steam stripping tower.

4. The low-viscosity-index extract is heated and fractionated for the removal of phenolic water and is then fractionated for the removal of phenol in a small tower situated above the phenolic water tower. It finally passes to storage through a steam stripper.

5. Steam and a little phenol are accumulated from the extract stripper, raffinate (vacuum) stripper and the phenolic water tower, and is sent to the absorber mentioned in Item 1 for recovery of phenol.

Fuel-Depot Operation

In the operation of fuel depots, we are interested in information of a text nature (for the use of students) pertaining to these three fields: (1) Transportation, (2) storage, and (3) issue of fuel oil, diesel oil, and gasoline both regular and aviation. It will be of great assistance to us if you can send such information to us or direct us to it.—J. A. R.

Such information has unfortunately not been collected into a single volume nor are there even suitable textbooks on each of the fields enumerated. A complete picture can be gained only by resorting to magazine articles, trade literature, and scraps of information scattered in numerous books. Nevertheless, the following is a list of some of the documents that pertain somewhat directly to various phases of the handling of oil:

Inspection and Sampling

*1. Instructions for Measuring, Sampling and Testing Oil Shipments, Standard Inspection Laboratory, Standard Oil Development Co., New York.

*2. Measuring, Sampling and Testing Crude Oil, A.P.I. Code 25, A.P.I., New York.

3. Newcomb, F. L., Inspection of Oil Refinery Equipment, Refiner and Natural Gasoline Manufacturer, p. 211, May 1935.

Testing and Sampling

*4. Federal Standard Stock Catalog, Sec. 4, Part 2, VV-L-791b, Superintendent of Documents, Washington, D. C.

*5. Petroleum Products and Lubricants, A.S.T.M., 210 Board Street, Philadelphia, published each September.

*6. New and Revised Tag Manual for Inspectors of Petroleum, C. J. Tagliabue Mfr. Co., Brooklyn, N. Y.

*7. Standard Methods of Testing Petroleum and Its Products, Institute of Petroleum (London) "Menson House" 26, Portland Place, London W. I., England.

8. Handbook of Chemistry and Physics, Chemical Rubber Publishing Co., Cleveland.

9. Scott's Standard Methods of Chemical Analysis, 2 Vol., D. Van Nostrand Co., New York.

10. U.O.P. Laboratory Test Methods for Petroleum and Its Products, Universal Oil Products Co., 310 South Michigan Avenue, Chicago.

Storage and Transportation

*11. Technical Bulletin 20 of Chicago Bridge & Iron Co., Chicago.

12. Handbook of Petroleum Asphalt and Natural Gas, Bulletin 25 of Kansas City Testing Laboratory, Kansas City, Mo.

Performance of Products and Their Issue

*13. The Significance of Tests of Petroleum Products, A.S.T.M., 210 South Broad Street, Philadelphia.

*14. Forbes, William G., Lubrication of Industrial and Marine Machinery, John Wiley & Sons, New York.

*15. Round, G. A., Fuels and Lubricants for U. S. Army Ground Forces, National Petroleum News, p. R-291, July 7, 1943.

*16. Richardson, J. A., III, Military Ground Forces Fuels and Lubricants, National Fuels and Lubricants meeting, S.A.E., November 4-5, 1943.

17. Holaday & Happel, A Refiner's Viewpoint on Motor Fuel Quality, Petroleum Engineer, Reference Annual, p. 251, 1943.

18. Evaluation of Petroleum Products, A.S.T.M., 210 South Broad Street, Philadelphia.

*The items marked with an asterisk are directly related to the topic at hand whereas other items contain some pertinent information.

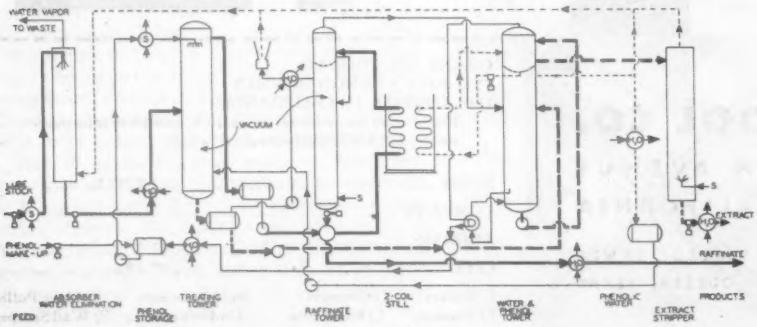


Fig. 1—Simplified flow diagrams—solvent extraction with phenol

Methods of Measuring Interfacial Tensions

ONE apparatus for measuring interfacial tension between oil and brine surfaces is the Bartell tube method. The procedure consists of introducing oil and water into the respective cups of the Bartell U-tube (Fig. 1) until the interface between the oil and water is exactly at the calibrated mark, C, on the capillary. Then the height of each liquid above the mark is measured by means of a cathetometer, and the interfacial tension calculated by means of the following formula:

$$I = 23.5\ (hd - h'd')$$

where

I = interfacial tension in dynes per centimeter
h = height of the oil column in centimeters
h' = height of the water column in centimeters
d = density of the oil in gram cubic centimeters
d' = density of the water in gram cubic centimeters
23.5 = a constant for the capillary used. This factor needs to be determined for each capillary tube as described by Bartell and Miller.*

*Page 1964 in reference at end of article.

TABLE 1—INTERFACIAL TENSION OF WATER AND OIL FROM TYPICAL OIL FIELDS

Field—	Company and well	Formation	Depth (ft.)	Interfacial tension of oil and water at 100° F.	Interfacial tension of oil and water at 130° F.
Breckenridge	Walker 5 Caldwell	Marble Falls	3,200	10.9	...
Banyon	Taylor Ref. 4 Ellison	Austin	2,255	13.6	12.9
E. Texas	Magnolia 5 W. B. Kee	Woodbine	3,660	10.9	9.6
Wortham	Pure Oil Co. 7 Boyd	Woodbine	2,800	7.3	...
Mexia	C. F. Lyttle 6 Thompson	Woodbine	3,000	19.0	17.6
Van	Van Joint Acct. 4 Morris 62	Woodbine	2,710	16.2	...
Tomball	Humble Oil 7 Townsite	Cockfield	5,541	13.6	...
Saxet	Shell Pet. 1 E. F. Flato	Catahoula	4,308	11.5	10.8
Big Lake	Big Lake Oil 140 Univ.	Ordovician	8,300	14.8	12.5
Echo	Brennan & Murray 14 Dibrell	Frye (Pa.)	1,950	24.6	18.6

All measurements are made in a constant-temperature bath so that the readings are recorded at a definite temperature. Measurements of interfacial tension between oilfield water and oil in typical Texas oil fields are shown in Table 1 (Fig. 2).

Hocott, using a much more elaborate apparatus and employing the drop method, was able to measure interfacial tension of oil and water under pressures and temperatures simulating oil-reservoir conditions. He found that the surface tension of water against gas decreased with the increase of temperature and with the increase of pressure, and that the interfacial tension between oil and water increased slightly with increase of pressure up to about 2,500 p.s.i. as shown in Table 2, and Fig. 2.

TABLE 2
Change of Interfacial Tension Between Oil and Salt Water With Pressure. Fluids From Conroe Oil Field at Temperatures of 170° F.

Pressure (p.s.i.)	Interfacial tension in dynes per cm.
0	25.1
470	26.8
1,540	29.5
2,580	32.6
3,500	31.2

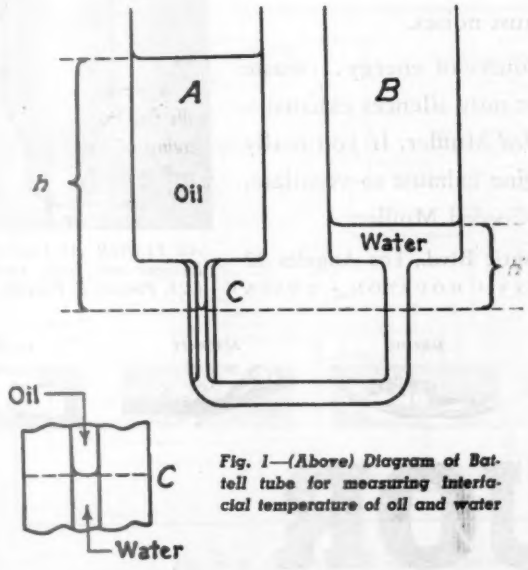
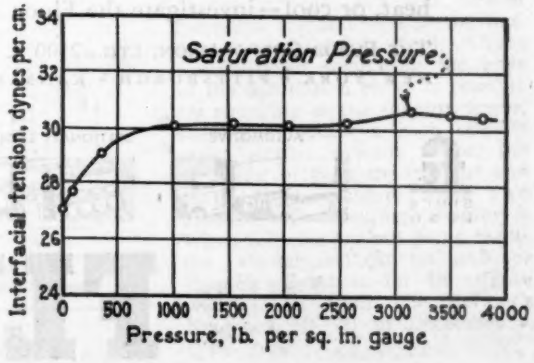


Fig. 1—(Above) Diagram of Bartell tube for measuring interfacial temperature of oil and water

Fig. 2—(Below) Graph illustrating effect of pressure on interfacial tension of oil and salt water. (After Hocott)



References

Bartell, F. E., and Miller, F. L., A Method for the Measurement of Interfacial Tension of Liquid-Liquid Systems, Jour. Am. Chem. Soc., Vol. 50, pp. 1961-1967, July 1928.

Hocott, C. R., Interfacial Tension Between Water and Oil Under Reservoir Conditions, A.I.M.E. Tech. Pub. 1006, pp. 1-7, 1938.

Livingston, H. K., Surface and Interfacial Tension of Oil-Water Systems in Texas Oil Sands, A.I.M.E. Tech. Pub. 1001, pp. 1-13, 1938.

Series prepared by F. B. Plummer, professor, petroleum engineering school, University of Texas

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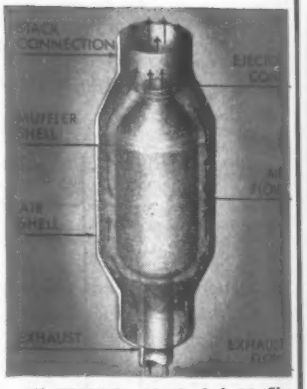

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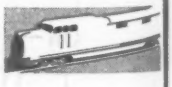
RAILROAD 

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Solvent Manufacture

ALTHOUGH so-called high-solvency naphthas or solvents are made from petroleum by special processes such as solvent extraction with sulfur dioxide, by hydrogenation, and more recently by the hydroforming catalytic cracking process, this discussion is limited to the distillation methods used to separate narrow-boiling-range fractions from crude oil. The solvents obtained by plain distillation still constitute the main bulk of the production. The separation of substantially pure hydrocarbons (pentane, cyclopentane, hexane, methylcyclopentane, heptane, etc.) from crude oil or natural gasoline is also gaining importance but this separation involves the use of towers with 100-150 plates and will not be discussed here.

Boiling ranges.—These extend from as low as 15°F. (from i.b.p. to e.p.) up to ranges of 165°F., but about 70 per cent of all plain petroleum naphthas have a boiling range between 50° and 100°F. The actual boiling-points range all the way from 100°F. for the lowest boiling naphthas to 500°F. for the highest boiling ones, as:

Naphtha or Solvent—	°F.
Rubber Cement	95-186
Lacquer Diluent	170-240
Varnish Makers & Painters	215-295
Mineral Spirits	305-400
Slow-dry Thinner	370-510

Thus, the entire gasoline of the crude oil as well as part of the kerosene can be incorporated into naphthas and solvents. A few refiners do this but it is a more common practice to make only one or two types of naphthas by "stealing" small amounts of these materials from the gasoline, and it is such an operation that is considered here. The removal of a naphtha in amounts of 3 to 8 per cent of the crude oil does not materially alter the properties of the remaining gasoline or kerosene.

Processing.—The main problem in manufacturing solvents is the amount of fractionation required. This will be discussed later in The Refiner's Notebook but as an indication the following number of trays may be used. It is also necessary to use large amounts of reflux (7-12) and to steam strip the products.

e.p. less i.b.p.	Number of Trays
160-240	10
100-140	20
60- 90	40

The same degree of fractionation can be attained with somewhat fewer trays if the reflux ratio is raised to the enormous value of 20. Only one fractionating tower is contemplated (as in the Fig. 1) and obviously fewer trays can be employed if two towers are used.

Many refiners produce solvents by the use of shell stills each connected with a fractionating tower. Such a method has the advantage of easy control because of the large volume of liquid holdup in the shell still. Others make wide boiling-range naphthas (over 100°F. range) by vigorously steam stripping a naphtha cut from the side of the regular topping tower.

For making one or two naphthas, the system of topping and solvent fractionation shown on this page is useful. If more than two solvents are regularly to be made, a system of several towers in which the residue from the first tower is fed to the second tower, etc., is preferable. In the system shown here, any product from the topping tower can be handled. Heavy ends are eliminated from the bottom through a steam stripper and the light ends that tend to appear in the solvent (side product) are eliminated to the top of the tower by means of vigorous steam stripping of the solvent. Top and bottom remnants are returned to the topping tower as reflux (feeds). Great flexibility in regulating the ends of the distillation curve is possible by stripping at the topping tower, feeding at either a high or low point in the solvent tower, the stripping of both the solvent and the solvent residue, and the amount of reboiling employed. When solvents are not being made, the reboiler coil can be used for topping. Symbols for the figure were taken from The Refiner's Notebook No. 21 of December 9, 1944.

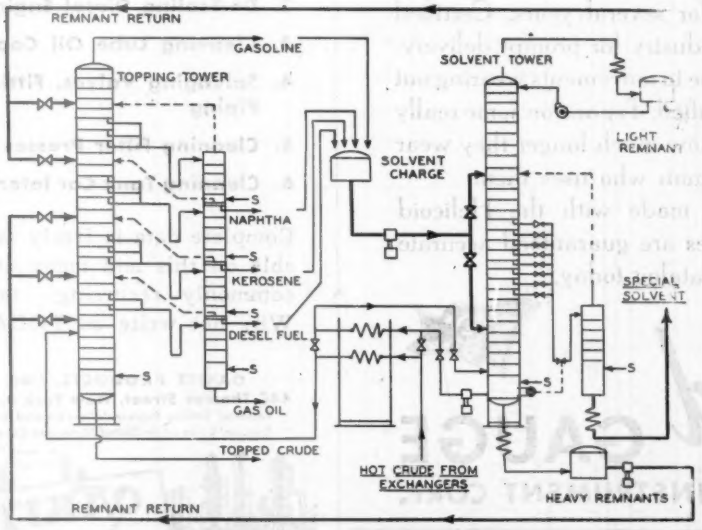
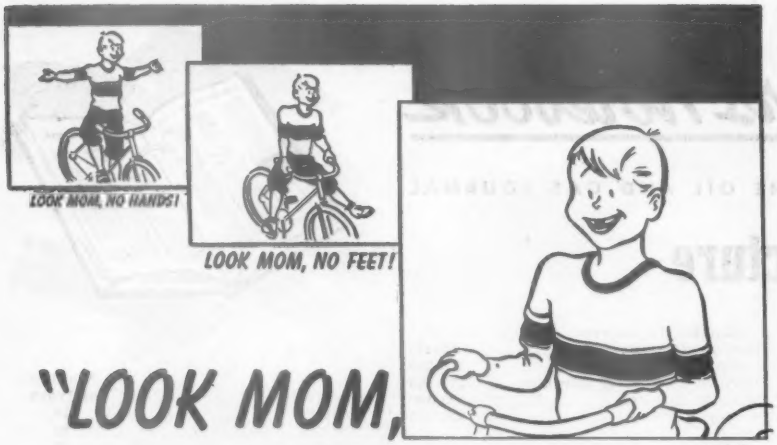
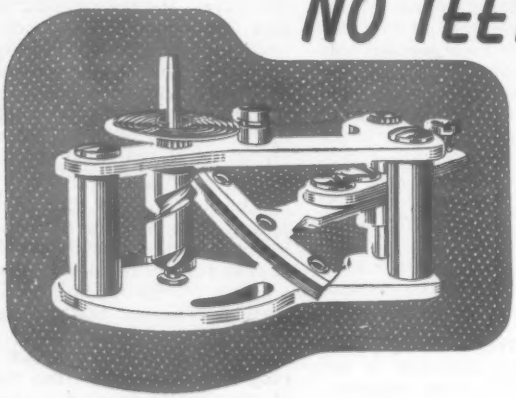


Fig. 1—A universal flow diagram for solvents

No. 33 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



"LOOK MOM, NO TEETH!"



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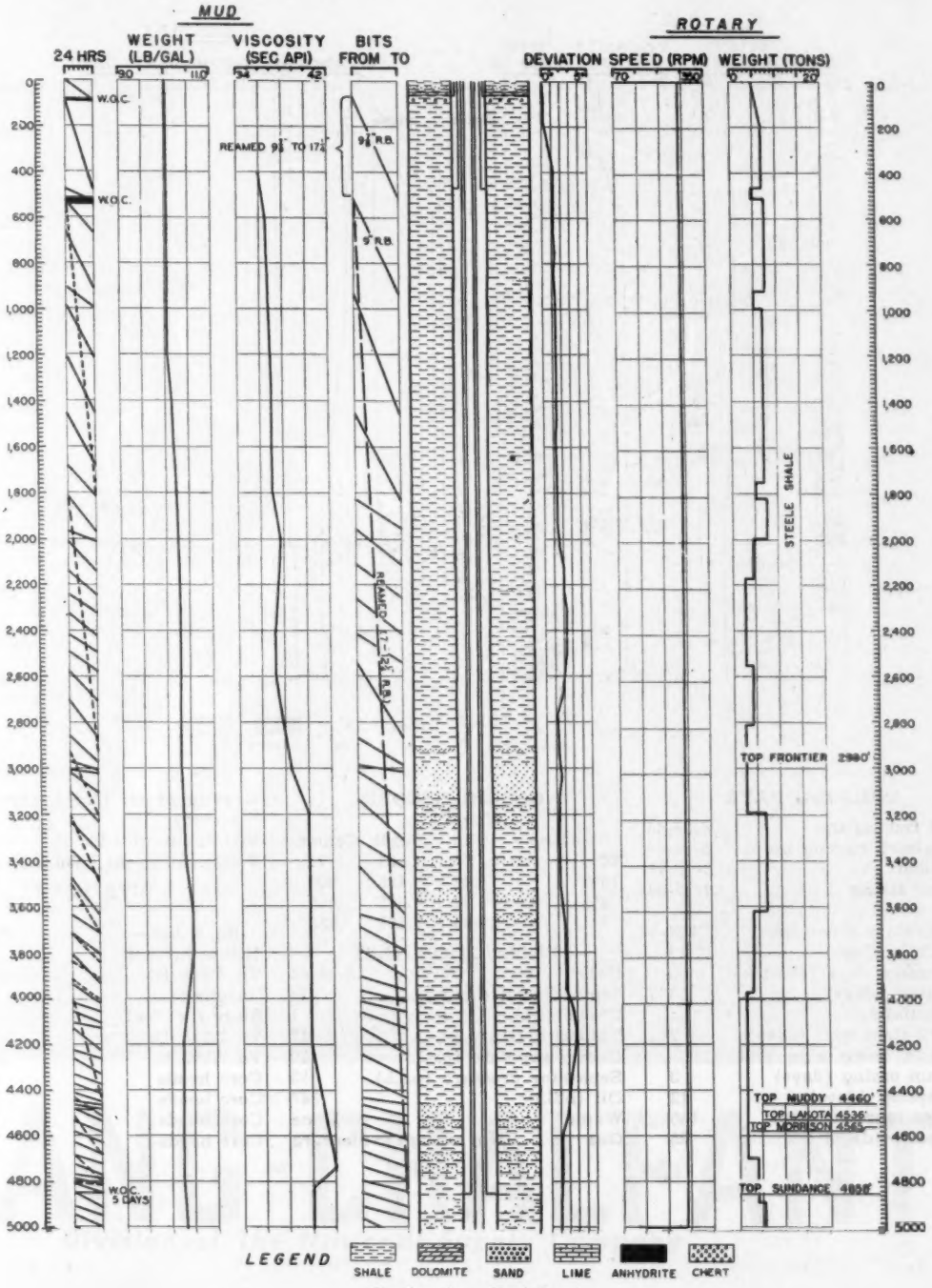
No. 68

Discovery Well of Sand Draw Field

SINCLAIR-WYOMING OIL CO. 1 UNIT
NW NW 14-32n-95w, Fremont County, Wyoming. Well elevation 6,142 ft.

CONTRACTOR
Peak Drilling Co.



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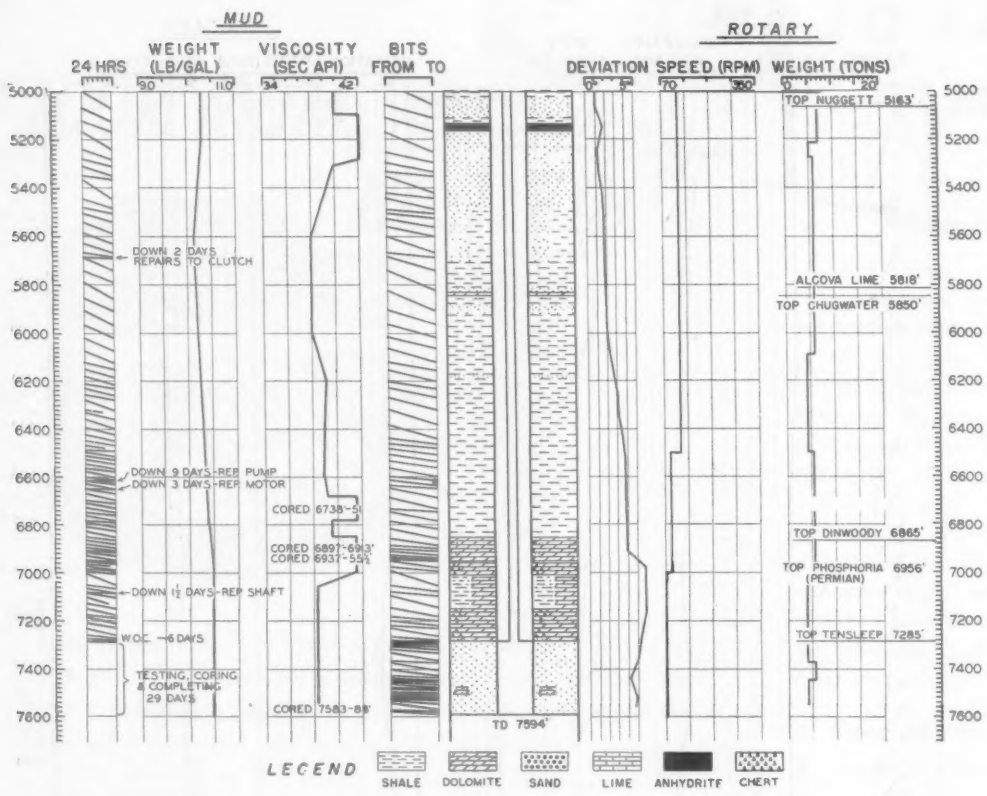
Discovery Well of Sand Draw Field (Continued)



DRILLING DATA

Start rigging up	4-28-44
Completed rigging up	5- 9-44
Spudded	5- 9-44
Set oil string	11- 7-44
Total rotary time (days)	234
W.O.C. (days)	13
Logging days (electric)	3
Coring (days)	3¾
Circulating	
Drill-stem tests (days)	7¾
Break down pipe and run casing (days)	3
Reaming (days)	12
Trips (approximate)	153
Repairs (days)	25

CASING RECORD

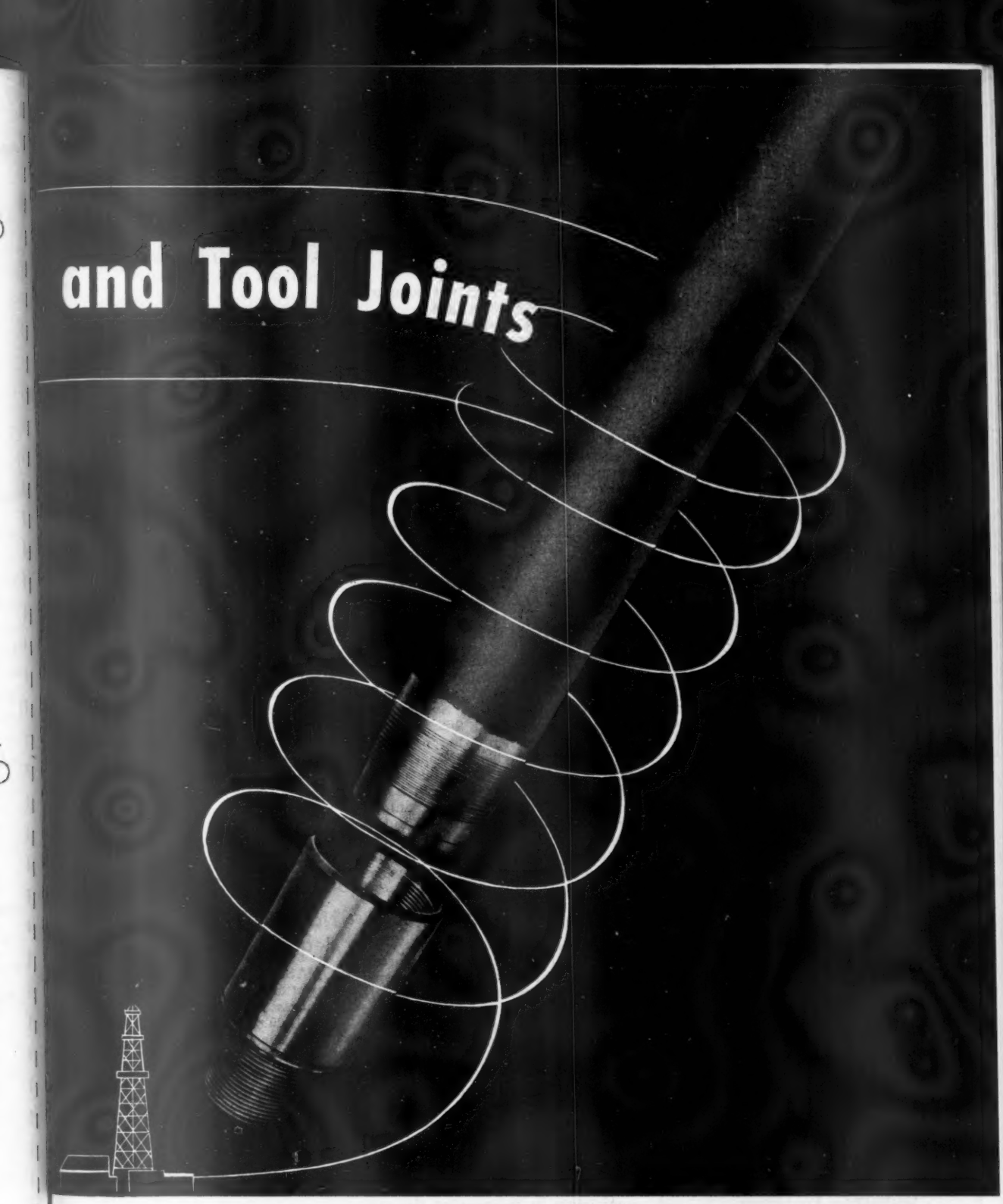
Size (in.)—	Weight (lb.)	Depth	Cement
20	90	62	75
13⅜	48	475	400
9⅝	32	4,815	450
7	23-26	7,281	250

PRODUCTION TEST

Date	12-30-44
Time flowed (hours)	24
Choke (in.)	1
Tubing pressure (p.s.i.)	17
Casing pressure (p.s.i.)	50
Separator pressure (p.s.i.)	13
Oil (bbl.)	967
Water	None
Gas	Not enough to measure
Gravity of oil (A.P.I. corrected)	35.4°
B.H.P. (lb. at 1,100 ft.)	3,303
Temperature (at 7,530 ft.)	170° F.

BITS USED

Rock bits—	No.	Size (in.)
Below surface	1	9⅞
To 4,848 ft.	33	9
Reaming	7	12¼
Sixty-six feet	1	8⅝
To 7,285 ft.	63	8¾
To 7,593 ft.	29	6⅛
Core heads	1	8¾
Core heads	2	7⅝
Core heads	1	5½
Core heads	1	5¾



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Natural Gas

United Gas Builds Cycling Plant in Carthage Field

CARTHAGE, Tex. — Construction of a cycling plant has been started by United Gas Corp. in the Carthage field, near here. The plant, to cost about $7,000,000, will have a daily capacity of 50,000,000 cu. ft. of natural gas.

In order to serve the plant the company will construct a gathering line in the field. A 24-in., 140-mile line will be built from the plant to Monroe, La., where connection will be made with the system of Tennessee Gas & Transmission Co.

Millions Can Be Added to Gas Income, Says Schoch

AUSTIN. — A conservation plan which, he said, should increase the total annual income of Texas natural-gas owners to $100,000,000 from its present level of around $23,000,000 was submitted last week to the state Railroad Commission by Dr. E. P. Schoch, professor of chemical engineering at University of Texas. Dr. Schoch, who was joined in his study by Dr. F. K. Pence and Dr. Simon Williams, directors of research in ceramics and cotton, said the gas age in Texas would be made three or four times longer by the plan.

The study was an outgrowth of informal hearings held by the commission last December on the conservation of natural gas. The report was made in response to the commission's request for written suggestions. The report included specific recommendations, probable results, and legislative procedure which may be necessary.

Natural-Gas Production in Kansas Shows Big Rise

WICHITA.—Production of natural gas in Kansas fields totaled 134,000,000,000 cu. ft. in 1944, compared with 122,000,000,000 in 1943, according to Kansas Corporation Commission. This was at the rate of 369,049,000 cu. ft. daily last year, in contrast with 334,492,000 in 1943.

The Hugoton field was the largest producer, the total output of the Kansas area of this field (it extends into Oklahoma and Texas) being 83,000,000,000 cu. ft. in 1944 compared with 63,000,000,000 in 1943.

Wartime production has placed a heavy drain on Kansas natural-gas reserves, but the huge Hugoton field assures an abundant supply for more than a century at present withdrawal rates, conservation officials of the commission said.

They cautioned, however, that the demand is still increasing. Last year withdrawals soared 12,613,326,000 cu. ft. over 1943, when 122,089,499,000 cu. ft. was marketed.

The field is approximately 70 miles long and 40 wide and contains more than 1,700,000 proven acres.

Stronger Gas-Conservation Law Proposed for Texas

AUSTIN. — A more far-reaching natural-gas conservation measure is to be introduced into the Texas legislature by Rep. F. G. Swanson, of Tyler. Swanson said his bill, prepared after consultation with the State Railroad Commission, would provide for ratable taking of gas from a reservoir; strengthen the commission's authority to enforce pressure-maintenance orders; and require gas pipe lines to gather casinghead gas produced with oil before drawing upon natural-gas reserves, where it is reasonable to do so.

The bill reads in part:

"It shall be the duty of the commission, after notice and hearing, to ascertain and determine the reasonable market demand for gas to be used for light and fuel purposes and for all lawful purposes to which sweet gas may be put under the terms of this article, and by proper order to restrict the production of gas and prorate same in various fields in this state to an amount equal to the reasonable market demand therefor.

"Gas produced with oil and reasonably accessible to market shall be given first consideration by the commission in determining the reasonable market demand for gas. In such order the commission shall allocate, distribute, or apportion, ratably, the total allowable production of gas from gas wells among the various gas wells affected by the order on a reasonable basis.

"It shall likewise be the duty of the commission to prorate ratably the daily gas well production of sour gas produced from each common reservoir of sour gas in this state.

"The hearing for such purpose shall be held at the same time as the hearing pertaining to the proration of sweet gas well production. The proration of sour gas well production shall be accomplished according to the manner and method herein provided for the proration of sweet gas well production."

Gas-Conservation Program Proposed in Louisiana

BATON ROUGE.—P. A. Frye, director of the recently named state natural-gas conservation committee, has addressed a request to Joseph L. McHugh, conservation commissioner, that McHugh institute an investigation with a view of adopting a state-wide program of gas proration and ratable taking.

Frye's letter said it was the unanimous view of his committee that the proration and ratable taking of gas constitutes one logical approach to its conservation.

Ratable production, he explained, means allocating existing demands for gas among all wells in a given field, including wells not owned by dominating producers.

The committee believes, Frye said, that the investigation should include a detailed examination of all gas-condensate fields, with a view to continuing the program of cycling these fields where possible.

Natural Gasoline

Natural-Gasoline Output Reaches New Record

WASHINGTON. — Daily average output of natural gasoline and allied products reached a new record of 12,990,000 gal. in December, 1944, U. S. Bureau of Mines announces. Total production for the year was 4,226,754,000 gal., 15 per cent above the mark made in 1943. The biggest increases were in Texas, Louisiana, California and Arkansas. Stocks totaled 178,584,000 gal. on December 31, a drop of 3,444,000 for the month and 12,138,000 gal. less than the inventories on December 31, 1943.

PRODUCTION
(Thousands of gallons)

	Dec.	Nov.
Natural gasoline	181,062	182,448
Cycle products	79,338	73,752
Liquefied petroleum gases:		
Isobutane*	16,758	18,690
Other L.P.G.*	125,538	95,718
Liquefied refinery gas	23,688	19,572
Benzol	8,400	8,400
Total	434,784	398,580

*At natural-gasoline and cycle plants.

REFINING

Pure to Build Lubricating Unit at Smith Bluff, Tex.

PORT ARTHUR, Tex. — Erection of an aviation lubricating unit at the Pure Oil Co.'s Smith Bluff plant, near Nederland, to cost around $5,600,000, has been recommended by War Production Board's production urgency committee. Petroleum Administration for War has approved the project as vital to the war effort. Construction is scheduled to start in 30 days with operation in about 11 months. The unit will require services of some 75 operators.

DPC Approves $15,000,000 Addition at Lake Charles

WASHINGTON. — Defense Plant Corp. announced last week that it had authorized the preliminary acquisition of machinery and equipment at a cost of $5,000,000 in connection with plant facilities at Lake Charles, La., estimated to cost approximately $15,000,000. Cities Service Refining Corp. of New York will operate these facilities, title remaining in DPC.

Two Plants Solve Problem Of Petroleum Residue

WASHINGTON. — Two refineries in Netherlands West Indies have solved the problem of disposing of petroleum residue, which in some cases must now be designated as temporarily unusable material as a result of wartime operations.

One, at Curacao, off the coast of Venezuela, pumps the pitchy substance through 3 miles of pipe line to a pit formed by damming one end of a shallow valley. This residue will become hardened, but in time may be partly recoverable. At Aruba, an island near Curacao, the residue is pumped through 2 miles of pipe to the brink of a cliff some 80 ft. above the ocean. It falls down the face to a beachlike area, which is dyked on the ocean side just as the Curacao Valley is dammed. This residue also may be partly recovered after the war.

The engineering and operating problems involved at Curacao in this storing process are far from ordinary. The pitch leaves the refinery at such a high temperature (about 300° F.) that it can be pumped 3 miles. The pipes themselves are constructed with allowance for expansion. In addition, hot gas oil (used again and again) is kept ready to follow the end of a "slug" of pitch to keep the line clear.

The Curacao refinery, owned by the Asiatic Petroleum Corp., has already filled one pit, which is only about a mile from the refinery.

Gulf Coast Gasoline Stocks Register Modest Upturn

HOUSTON.—Stocks of all grades of gasoline and naphthas at plants of Gulf Coast Refiners Association members registered a modest upturn in the first half of February, standing at 1,854,031 bbl., a gain of 85,195. The total a year ago was 1,658,492 bbl. Automotive gasoline stocks considered alone were 639,146 bbl., an increase since January 3 of 58,842, but only 57 per cent of the 1,118,756 bbl. reported on February 15, 1943.

Total stocks of all products were 3,968,996 bbl., an increase of 8,434 bbl. A year ago total products stocks were 4,058,685 bbl.

Crude runs totaled 119,328 bbl. daily, which is 82.3 per cent of rated operating capacity. A year ago the group processed 113,557 bbl. a day.

United Nations Refineries Operating at Capacity

WASHINGTON. — Virtually all the 66 refineries of 22 United Nations, excluding the United States and the Soviet Union, are operating at maximum capacity, Petroleum Administrator Harold L. Ickes announced last week. These plants processed 1,450,000 bbl. of oil products daily in 1944.

Working under wartime difficulties unknown to the petroleum industry of North America, the refineries of our own nationals abroad and those of our allies are contributing their full share against the common enemy, Administrator Ickes added.

Throughout the war, the output of the British refineries in the Middle East and elsewhere has been drawn upon for war purposes to the greatest extent possible within the limits imposed by the shortage of tankers and the refinery capacity for turning out military products.

Earlier in the war, when Mediter-

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ranean travel was too dangerous, the shortage of tankers and the greater distances from the Persian Gulf and even from the Caribbean area to the fighting fronts, compared with the length of shipping routes from the United States, prevented major foreign refineries from making their maximum contribution to the prosecution of the war.

The few foreign refineries that are not operating at maximum capacity are those that are undergoing repair of damages caused by bombing, those that cannot be supplied with sufficient quantities of crude oil, or those whose products cannot be moved because of the continued shortage of tankers.

Coffeyville Plant to Get Oil From Cooperative Wells

COFFEYVILLE, Kans.—The 1,045 bbl. of sweet crude produced daily by 68 wells recently purchased from E. M. Adair and Paul M. Morton by Cooperative Refinery Association will come to the association's refinery in Coffeyville. The wells, with 4,375 acres of undeveloped leases acquired with them, are in Butler, Cowley, Barton, McPherson, and Marion counties.

The association is producing nearly 80,000 bbl. of crude oil a month from its owned leases for the Coffeyville refinery. The latest purchase will increase that volume to almost a fourth of the requirements of the plant.

Drilling operations on the Adair-Morton acreage will be started soon, it is planned. The association now has four wells going in Kansas and a fifth about to be spudded in.

Consumers Cooperative Association, of which Cooperative Refinery Association is a subsidiary, is owned by 792 local consumer cooperatives in nine midwestern states which serve 160,000 farm and city consumers. In 1940 the parent organization started operation of the first consumer-owned oil refinery in the United States, a $750,000 plant built by cooperatives at Phillipsburg, Kans. Today, consumer cooperatives in the United States and Canada own and operate 10 refineries and are the largest independent refiners in America.

Misunderstanding Reported In Status of Cooperatives

AUSTIN.—The policy of Texas regarding sale of petroleum products in the state, by cooperative organizations has been a subject of misunderstanding, according to state officials. Belief has prevailed that a ruling of the attorney general had forbidden oil sales in Texas by cooperatives.

Foreign-chartered cooperative marketing associations are subject to state franchise taxes, according to an opinion by Grover Sellers, attorney general. The opinion now guiding Claude Isbell, secretary of state, was written in October 1944, concerning an application of Indiana Farm Bureau Cooperative Association, Inc., an Indiana corporation, to do business in Texas. It received a marketing permit.

The attorney general recommended that the Indiana association's application for a Texas marketing permit be granted, but that the association be subject to limitations of its purpose clause, which does not allow engaging in the oil business.

There is no prohibition in Texas against farm cooperatives engaging in the oil business, if their purpose clauses permit it, according to officials here.

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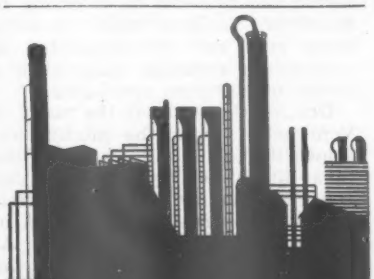
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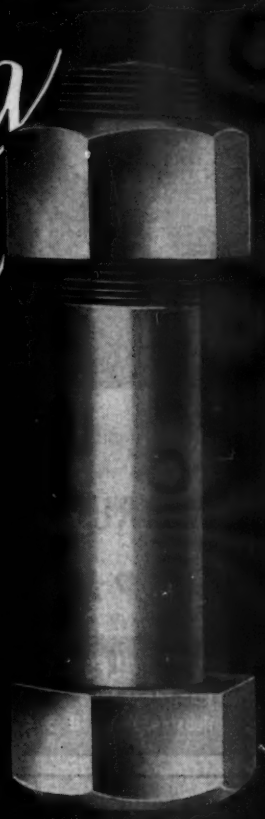

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Tenn. G. & T. Plans for 96-Mile So. Texas Line

Tennessee Gas & Transmission Co. has applied to the Federal Power Commission for permission to build a 96-mile 16-in. line from Agua Dulce to San Salvador, Tex. It is reported that construction may be under way in the last quarter of this year. Application for the project was made at the same time that permission was requested for the building of four stations on the Tennessee line at points east of Monroe, La., for which an AA-1 priority has been granted by War Production Board. The program calls for immediate construction of stations.

The building of the stations is to be carried on with financing by Defense Plant Corp. The Agua Dulce-San Salvador line is to be financed entirely by the Tennessee company.

Metropolitan Eastern Plans Line From Texas to Ohio

WASHINGTON.—Metropolitan Eastern has applied to Federal Power Commission for permission to build and operate 825 miles of 18-in. natural-gas pipe line from the East Texas gas fields to Ohio. The project would include five compressor stations totaling 25,600 hp. and have an initial daily capacity of 140,000,000 cu. ft. of gas. Total cost is estimated at $23,500,000.

The project is designed to alleviate the shortage of natural gas in Ohio and surrounding territory now seriously curtailing the production of vital war equipment, the application states. Its fundamental economics, the application says, "indicate that under initial operating conditions with the apparent load factor, a rate of 20 cents per Mfc will be substantiated, with a good possibility of reduction from this rate in later years."

Metropolitan Eastern is a new corporation, organized under the laws of Delaware with principal offices in Wilmington, to construct and operate this particular line. It is proposed to start construction in April and complete it by October 31. It is proposed to move natural gas for resale to distributing companies in Ohio.

Olin Culberson of the Texas Railroad Commission last week asserted that either a commission protest or his individual objection will be filed with the Federal Power Commission opposing the proposed Metropolitan Eastern line.

United Line to Provide An Important Link

The 140-mile 24-in. line from the Carthage field, Texas, to the company's Sterlington compressor station near Monroe, La., which United Gas Pipe Line Co. plans to build this year will supplement United's reserves in the Monroe field as well as deliver 100,000,000 cu. ft. daily into the Tennessee Gas & Transmission Co. system. It is reported by United Gas Pipe Line Co. that the Tennessee company has estimated the gas reserves available to it in the Carthage field at 1¼ trillion cubic feet with an expected life of 20 years.

According to R. H. Hargrove, vice president and general manager of United, the company proposes to operate the line initially at a pressure of 700 p.s.i. at Carthage and 500 p.s.i. at Sterlington. The line is designed to operate at pressures up to 1,000 p.s.i. pressure if desired.

Included in the construction proposal are plans for two measuring stations to be located at the Carthage end of the line, and two in the Monroe area. A telephone line and facilities approximately 140 miles long will also be built, paralleling the pipe line and interconnecting with the company's communication system.

Montana-Dakota Plans Enlargement of Facilities

Federal Power Commission set hearing for 10 a.m., March 7, 1945, at Washington, D. C., to consider applications from Montana-Dakota Utilities Co., Minneapolis, Minn., for (1) a certificate for the extension and enlargement of its facilities in Valley County, Montana, and (2) for approval of the abandonment of certain of its existing facilities, also in Valley County.

In detail the Montana-Dakota Utilities Co. proposes to install one new 300-hp. compressor in its Saco compressor plant and two 300-hp. units in its Fort Peck compressor plant, both in Valley County. The company also seeks approval of the abandonment of about 9½ miles of 6-in. natural-gas pipe lines which, the company's application states,

has been looped by an 8-in. line. Due to deterioration, it is now out of service.

Panhandle Eastern Hearing Postponed to April 12

WASHINGTON. — Federal Power Commission has postponed to April 12 the hearing previously set for March 7 in Chicago on Central Illinois Public Service Co.'s petition for an order directing Panhandle Eastern Pipe Line Co. to extend its pipe line to connect with the former company's distribution system and serve it with sufficient gas to meet its requirements in four eastern Illinois communities. The hearing was postponed in response to a request from counsel for the petitioner and respondents.

Large Outlets Planned For Carthage Field

In addition to the United Gas Pipe Line Co.'s 140-mile 24-in. from the Carthage field, Texas, to Monroe, La., several other projects are either in the early stages of planning or already under way. These include Lone Star Gas Co.'s 90-mile Carthage-Trinidad, Tex., line for which unloading of pipe has started. Southern Natural Gas Co. is reported to be considering laying a 14-in. line from Carthage to Logansport, La., as well as looping the present line between Logansport and Monroe. Arkansas Natural Gas Co. is said to be considering a line from Carthage to connect with its North Louisiana system.

Pipe Delivery Changes Postpone Interstate Line

As a result of recent congestion of railroad traffic due to snow storms in northern states it is reported that deliveries of pipe to Interstate Oil Pipe Line Co. will be later than the original schedule. This will postpone somewhat the starting of construction of a system for moving oil from Mississippi fields. Plans have been modified to provide for laying a 38-mile 8-in. line from the Cranfield pool, Mississippi, to Liberty station, a 32-mile 10-in. line from Mallalieu field to Liberty station and a 50-mile 12-in. line from Liberty station to Maryland tank farm north of Baton Rouge, La.

Northern Natural Builds River Crossing Facilities

Northern Natural Gas Co. has contracted new facilities at two rivers, as follows: Pittsburgh-Des Moines Steel Co. is starting work on a bent-type steel pipe-line bridge over Silver Creek near Silver City, Iowa, on the 24-in. main line. Omaha Dredge & Dock Co. is preparing to start work on a contract for laying pipe at a crossing of the Elkhorn River on a 16-in. line. Across the river pipe will be laid which is 18-in. o.d. and 16½-in. i.d.

B. of M. Starts World's Biggest Helium Storage

WASHINGTON.—The biggest helium storage reservoir in the world is being started by the Bureau of Mines in the 50,000-acre Government-owned Cliffside natural-gas field, near Amarillo, Tex. There surplus helium will be piped back underground for future use.

Completion of a 32-mile helium pipe line between the Exell and Amarillo helium plants of the bureau, together with pipe-line connections to the Cliffside field will permit the use of this natural underground storage place for the helium not needed now by military or government agencies and not required for commercial distribution.

Although the helium piped back into the ground must be repurified when it is withdrawn, the gas from the cache will be richer in helium content, the processing time will be reduced, and there will be immediate supplies of this valuable, lightweight gas on short notice.

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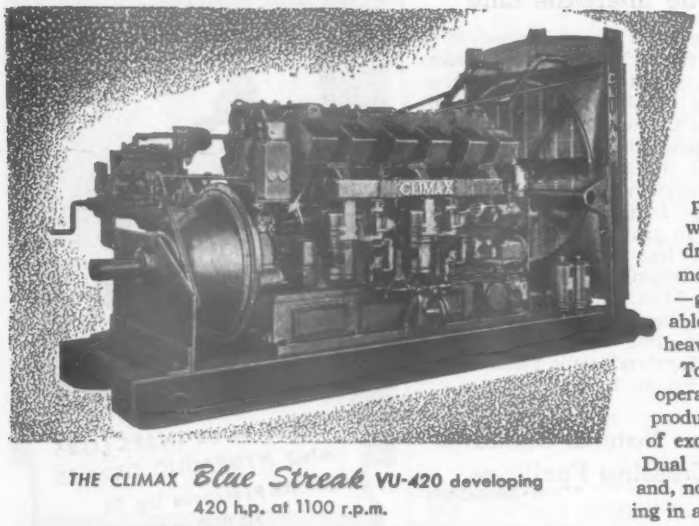

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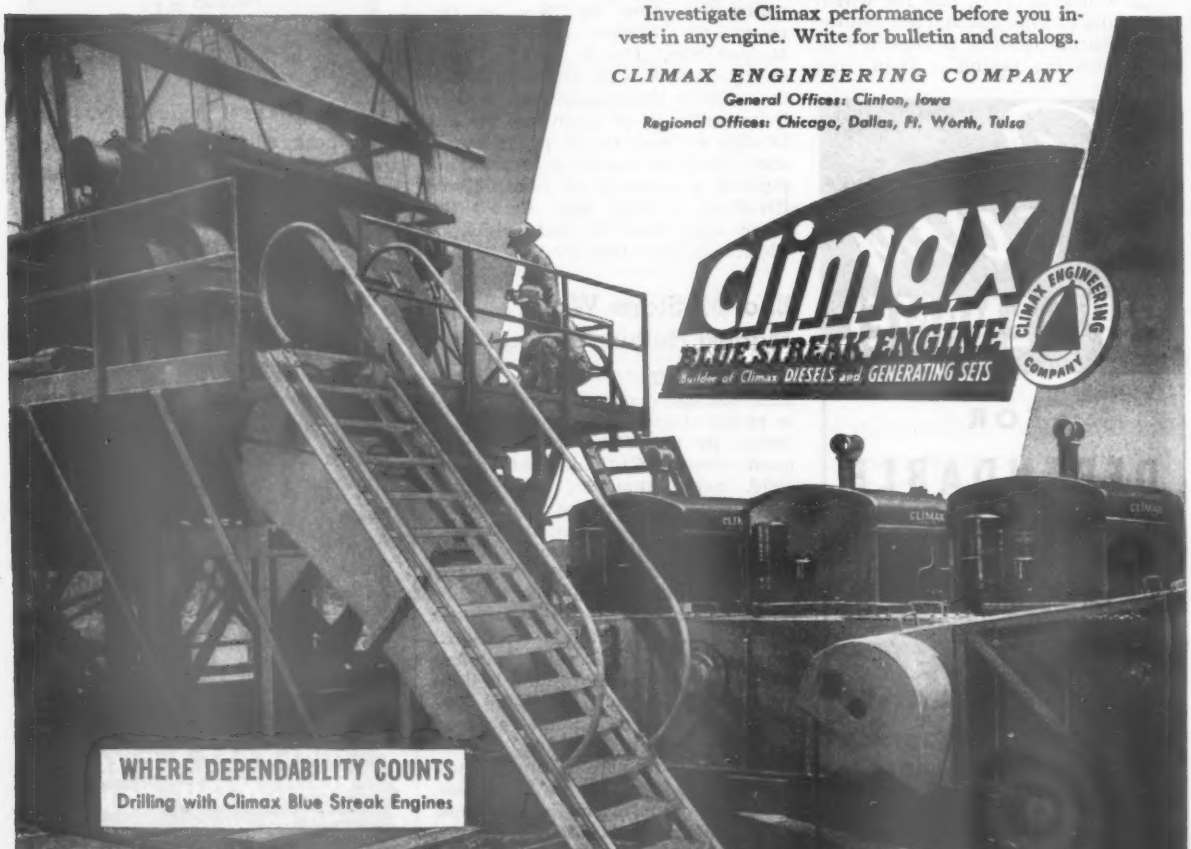

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Exploration and Drilling

Week's Highlights

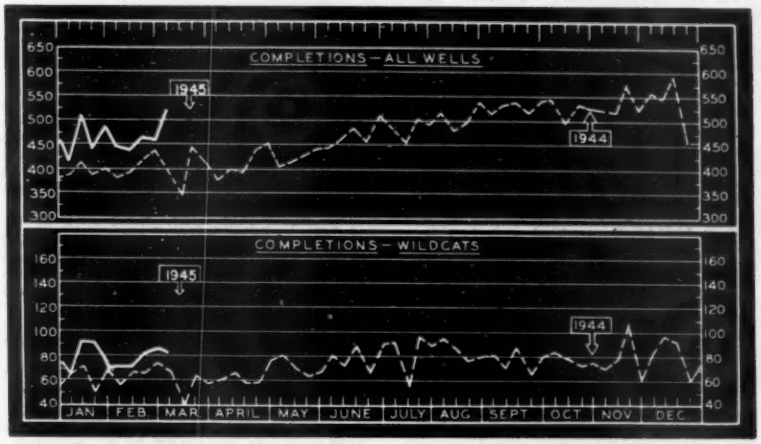
DEVONIAN production in West Texas is assuming more importance, now that it is producing in three places, in two of which at least, the Ellenburger is dry. It not only offers attractive possibilities of obtaining light oil, but also reduces the risks attendant upon Ellenburger tests by adding another potential producing horizon for deep wildcats.

This is illustrated in the recent completion of Stanolind Oil & Gas Co. 1-D University, elevation 3,377 ft., Section 8, Block 11, University Lands, 5 miles west of the Embar field in southwestern Andrews County, a test located on a block of 4,026 acres obtained by paying a $900,000 bonus, plus an obligation to drill a 10,000-ft. test.

The well was carried to 10,466 ft., penetrating 386 ft. of Ellenburger, topped at 10,080 ft. Finding nothing in the Ellenburger, it was plugged back to test the Devonian topped at 7,968 ft. After acidizing a pay zone at 8,300-50 ft., the well started flowing 575 bbl. per day of 39° gravity oil.

The Stanolind well is about 15 miles south of the Devonian production opened last August by Mid-Continent Petroleum Corp. 1-7 University, in Section 20, Block 13, Andrews County, 2 miles south of the Fullerton field. About 20 miles south of the Stanolind well, in Ector County, Cities Service Oil Co. and Shell Oil Co., Inc., 1 T. P. Lands, Section 7, Block 45, T-1-S, also found Devonian production, after being dry in the Ellenburger.

All three finds are on a trend roughly paralleling the Permian fields that lie immediately east, probably indicating that as the Devonian rises sharply eastward toward the Central Basin Platform, oil accumulation may be found near the top of the fold. From south to north, datum on the top of the Devonian is —4,521 ft.; —4,591 ft.; and —5,165 ft. The pay zones in the Cities Service-Shell test on the south end and the Mid-Continent discovery on the north are only 20 to 30 ft. below the top of the Devonian as logged, whereas the Stanolind test, in the middle, found the pay zone 330 ft. in the Devonian.



Solid line charts current weekly completions, service wells in Eastern area included

COMPLETIONS IN ALL FIELDS . . .

Week ended March 3, 1945

	Oil	Gas	Dry	Total	Footage	Total Comp. to date 1945	1944
N. Y., Penna., W. Va.	51	28	*42	121	193,800	887	544
Ohio	1	3	4	8	17,456	119	156
Indiana	0	0	3	3	5,266	35	46
Kentucky	2	0	4	6	10,192	88	98
Illinois	24	0	10	34	89,559	305	289
Michigan	4	0	8	12	25,271	119	96
Kansas	22	5	11	38	133,466	248	296
Nebraska, Missouri, Iowa	0	0	1	1	2,762	9	11
Oklahoma	42	1	10	53	245,822	409	252
Texas:							
North Central	21	0	26	47	117,419	349	210
West	27	0	9	36	152,731	315	245
Panhandle	3	0	1	4	11,688	90	22
Eastern	1	2	3	6	36,349	48	51
Gulf Coast	20	2	11	33	220,495	275	86
Southwest	16	0	4	20	103,549	113	178
Total Texas	88	4	54	146	642,231	1,190	792
Louisiana:							
Northern	5	1	2	8	43,028	50	44
Southern	6	0	1	7	70,434	101	68
Total Louisiana	11	1	3	15	113,462	151	112
Arkansas	0	0	1	1	10,006	26	37
Mississippi	8	0	3	11	74,890	55	26
Southeastern States	0	0	1	1	4,310	4	†
Montana	5	1	0	6	14,653	51	39
Wyoming	5	1	2	8	29,860	40	21
Colorado-Utah	0	0	0	0	0	6	7
New Mexico	8	0	6	14	48,262	87	68
California	37	1	6	44	142,756	391	301
Total United States	308	45	169	522	1,803,824	4,200	3,191
Total previous week	230	44	186	460			
Total March 4, 1944	226	31	101	358			

*Includes 40 service wells. †Included in total shown for Mississippi.

SOUTHWEST TEXAS

Bee County Discovery Flows 110 Bbl. Daily

CORPUS CHRISTI.—Fred W. Shield 1 J. L. Courtney, new discovery at Tulsita townsite, in Bee County, flowed 110 bbl. per day through ⅛-in. choke, tubing pressure 725 lb., casing pressure 1,125 lb., gravity 37.8°, no water, gas-oil ratio 675 to 1, from perforations at 7,048-59 ft. Total depth 7,504 ft., with 5½-in. casing set at 7,227 ft. Rig is being moved on location for 2 Courtney.

Sun Oil Co. 1 R. A. Thompson, wildcat, 5 miles southwest of Goliad, in Goliad County, blew out while coring at 11,191 ft., making gas and oil. It is reported the well now is testing through a stuck drill pipe flowing 44°-gravity oil.

Humble Oil & Refining Co. 1 Sullivan, wildcat, 8 miles southeast of Falfurrias, in Brooks County, is coring ahead after recovering 50 ft. of mud and 1,30 ft. of 40.7°-gravity oil on drill-stem test at 8,538-45 ft.

SUCCESSFUL WILDCAT COMPLETIONS IN SOUTHWEST TEXAS

Bee County: New oil pool—Fred W. Shield 1 J. L. Courtney, Geo. Kerr Sur., in Tulsita townsite, top sand 7,030 ft., TD 7,504 ft., pref. 7,048-59 ft., PT 110 bbl. daily through ⅛-in. choke, GOR 675 to 1, TP 725 lb., CP 1,125 lb., gravity 37.8°, no water.

Karnes County: New oil (condensate) pool—Phillips Petroleum Co. 1 W. P. Belkhap, Jr., Chas. Haynes Sur., 7½ mi. SW of Kenedy, TD 8,033 ft., perf. 24 holes 7,031-7,035 ft., PT 110 bbl. daily, 14/64-in. choke, GOR 21,000 to 1, TP 2,175 lb., gravity 59, no water.

WILDCAT FAILURES COMPLETED IN SOUTHWEST TEXAS

Bastrop County: Seaboard Oil Co. of Delaware and Shamrock Oil & Gas Co. 1 Bertha Artmann, Oglesby Sur., 6 mi. S of Bastrop, dry at 9,260 ft.

McMullen County: Quintana Petroleum Co. 3-D South Texas Syndicate, Inc., GB&CNG Sur., 10 mi. SW of Fowlerton, dry at 15,301 ft.

Refugio County: Hewit & Dougherty 3 K. D. Roche, Thos. O'Connor Sur., Blk. 63, dry at 6,502 ft.

San Patricio County: Jay Simmons 1 H. R. Brown Est., J. J. Summers subd., Blk. 15, 2½ mi. SE of Mathis, dry at 5,507 ft.

PERMIAN BASIN

Prospective Discovery Flows 200 Bbl. in 6 Hours

MIDLAND.—Humble Oil & Refining Co. 1 J. M. Parrott et al, Section 3, EL&RR Survey, prospective discovery in eastern Upton County, 18 miles northeast of Rankin, blew out at 9,576 ft. and flowed 200 bbl. of oil in 6 hours. The well was cored at 9,576-96 ft. and recovered 16 ft. of lime and shale with slight show of oil. Core again was taken from 9,594-9,612 ft. and 13½ ft. of shale with thin streaks of lime showing some oil and gas was recovered. After core has been cut from 6,912-30 ft. survey will be run. Humble 1 Mrs. W. E. Gresham, wildcat 1 mile west of 1 Parrott, is drilling below 5,772 ft. in lime and shale.

Ector County.—Rowan Drilling Co. 1 TXL, 2¾ miles southeast of Shell Oil Co., Inc., and Cities Service Oil Co. 1 TXL, discovery well, after flowing oil on a drill-stem test from 7,837-76 ft., was drilling below 7,898 ft. in slightly harder formation showing some signs of oil. Phillips Petroleum Co. 1-A TXL, 1¾ miles southeast of the discovery well, was drilling below 7,692 ft. in lime. Shell and Cities Service 1-B TXL, 1½ miles south of 1 TXL, was drilling ahead at 6,590 ft.

Andrews County.—Sun Oil Co. N. H. Martin, wildcat approximately 1½ miles north of the Embar field in southern Andrews, is setting 7-in. casing at 6,790 ft. to complete in open hole to 7,045 ft., total depth, after recovering 90 ft. of free oil and 180 ft. of oil and gas-cut mud from 60-minute drill-stem test from 6,980-7,040 ft. Magnolia Petroleum Co. 1 Joseph Martin, 5 miles south of Mid-Continent Petroleum Corp. 1-7 University, Siluro-Devonian discovery in northwestern Andrews, is drilling below 9,042 ft. in lime. Humble 1 E. M. Jones, wildcat in western Andrews, is drilling below 6,762 ft. in lime. Shell and The Texas Co. 1 Ratliff & Bedford, southwestern Andrews wildcat, is drilling below 8,591 ft. in shale.

Humble 1 Overton Black, Section 17, Block 119, GC&SF Survey, northeast outpost to the Fort Stockton pool in Pecos County, on a 10-minute drill-stem test from 2,739-2,835 ft. showed gas to the surface in 2 minutes and an estimated 1,200,000 cu. ft. of gas in 9 minutes, and recovered 210 ft. of gas-cut mud. It is being cored from 2,825-43 ft. Warren Petroleum Corp. 1 C. L. Jones, wildcat 4 miles east of the Vincent pool, with first saturation logged from 4,983-5,006 ft. and porosity from 4,988-97 ft., is now drilling below 5,009 ft.

WILDCAT FAILURES COMPLETED IN WEST TEXAS

Andrews County: Union of Calif. 9 J. D. Biles, Sec. 12, Blk. A-31, PSL Sur., elev. 3,403 ft., deep test in Union pool, San Angelo 5,640 ft., Clear Fork 6,120 ft., dry in Devonian, TD 8,803 ft.

Cochran County: Honolulu 1-B-5 Hudson, Sec. 5, Blk. P, PSL, 2½ mi. SW Rhodes, elev. 3,720 ft., dry, TD 5,163 ft.

Lubbock County: Magnolia 1 L. D. Johnson, Sec. 88, Blk. C, D&WC Sur., 3 mi. SE Idalou, elev. 3,166 ft., Mississippian 9,550 ft., Detrital 10,054 ft., Ellenburger 10,066 ft., dry, TD 10,178 ft.

Tom Green County: Texas 1 Gorman, Sec. 85, Blk. 11, SPRR Sur., elev. 1,836 ft., Ellenburger 4,975 ft., dry, TD 5,540 ft.

Borden County: Texas 1 Clayton & Johnson, Sec. 41, Blk. 32, T-4-N, T&P Sur., elev. 2,551 ft., dry, TD 7,540 ft.

SUCCESSFUL WILDCAT COMPLETIONS IN WEST TEXAS

Andrews County: Pool extension — Union of Calif. 6 Biles, C SE NE Blk. A-31, PSL, elev. 3,405 ft., Tubb 6,650 ft., top pay 6,950 ft., pumped 50 bbl. day through 2-in., gravity 41.8°, gas-oil ratio 408 to 1, TD 7,460 ft.

Crane County: New Pay — Texas 3-B Hobbs, Sec. 33, Blk. 35, H&TC Sur., elev. 2,377 ft., San Andres 2,060 ft., top pay 3,190 ft., plugged back to 3,225 ft., flowed through 20/64-in. choke on 2-in. tubing, gravity 42°, gas-oil ratio 1,466 to 1, Ellenburger 6,565 ft., TD 6,710 ft.

WILDCAT FAILURE COMPLETED IN PANHANDLE

Collingsworth County: L. Snoddy Bros. 1 R. Wischkaemper, Sec. 63, Blk. 16, H&GN Sur., 5½ mi. N Lutie, elev. 2,260 ft., dry, TD 2,306 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—Skelly Oil Co. 2 E. L. Steeler, 17-23s-37e, prospective discovery 6 miles southwest of Gulf Oil Corp. 1 Drinkard, discovery in southeastern Lea County, failed to complete a drill-stem test on pay sections from 6,505, 6,600 ft. when drill pipe collapsed near bottom of hole. However, there was a steady blow with some oil during the attempt to test. It is drilling below 6,637 ft. in dry lime. A north offset of 1 Drinkard, Gulf 1 Max Gutman, 19-22s-38e, plugged back to 6,971 ft. from 7,010 ft., the total depth. It was perforated from 6,845-6,960 ft., swabbed dry and was preparing to perforate higher. Humble Oil & Refining Co. 2 Federal-Leonard, 13-26s-37e, in the Dublin area of southeastern Lea, cored from 5,228-46 ft. and recovered 18 ft. of lime with no shows reported. It is drilling ahead at 5,530 ft. in lime.

SUCCESSFUL WILDCAT COMPLETION IN SOUTHEASTERN NEW MEXICO

Lea County: E. J. McCurdy 1 Young, 20-18s-32e, 3 mi. S Maljamar field, elev.

DAILY AVERAGE PRODUCTION FOR WEEK

	Mar. 3 crude oil	Distillate, allied products	March PAW quota all oils	Feb. 24 crude oil
Alabama	250	.....	300	250
Arkansas	81,100	5,200	85,200	82,100
California	905,500	58,810	966,160	902,450
Colorado	10,150	.....	9,500	10,400
Eastern	61,000	8,400	76,600	60,100
Illinois	206,000	12,000	210,000	205,800
Indiana	12,700	.....	12,000	12,900
Kansas	244,400	4,300	278,300	272,850
Kentucky	29,700	3,200	35,200	31,900
Louisiana	364,600	40,000	400,000	363,600
North Louisiana	69,800	.....	.....	68,800
South Louisiana	294,800	.....	.....	294,800
Michigan	46,800	700	47,700	44,500
Mississippi	53,400	.....	53,000	51,450
Montana	23,300	300	23,300	22,350
Nebraska	900	.....	1,000	950
New Mexico	103,800	4,900	109,900	103,750
Oklahoma	368,600	28,000	391,000	368,500
Texas	2,152,500	156,000	2,316,000	2,146,400
East Texas	392,000	.....	.....	392,000
East Central Texas	150,300	.....	.....	144,200
North Central Texas	148,800	.....	.....	148,800
Texas Panhandle	88,000	.....	.....	88,000
West Texas	464,300	.....	.....	464,300
Southwest Texas	347,000	.....	.....	347,000
Gulf Coast	562,100	.....	.....	562,100
Wyoming	99,000	3,600	103,600	97,000
Total United States	4,763,700	325,410	5,118,760	4,777,250
Change from previous week	down 13,550			

Total production January 1-March 3, 1945 ..... 293,583,410 bbl.
Same period last year ..... 276,955,025 bbl.

3,747 ft., top pay 3,765 ft. Seven Rivers, flowed 376 bbl. through 2-in. TD 3,783 ft.

WILDCAT FAILURES COMPLETED IN SOUTHEASTERN NEW MEXICO

Chaves County: Steinberg & Sanders 1 Kimes, 11-15s-29e, elev. 3,685 ft., Grayburg, 2,565 ft., dry, TD 3,616 ft.

Lea County: Humble 1 Federal-Keinath, 8-21s-38e, 6 mi. NE Eunice, elev. 3,582 ft., Simpson 8,990 ft., Ellenburger 9,682 ft., dry, TD 9,954 ft.

Vickers Pet. 1 State, 2-16s-34e, 8 mi. N Vacuum pool, elev. 4,084 ft., dry, TD 5,247 ft.

CANADIAN FIELDS

Tests Continue in North Turner Valley Extension

CHATHAM.—In the Turner Valley North Extension area, Home Oil 18, LSD 7, 18-21-3w5, finished at 9,083 ft. with Madison at 8,362 ft., is continuing tests which indicate a much larger production than first estimated. The well, originally started as an exploration venture north and west of the proven area, got three producing horizons in the Madison, with flush production of 100 bbl. an hour after partial acidization and gas-cap indications in the top horizon, which is being shut off, temporarily. Home Oil is now planning to test a northwest extension of the producing area and has located Home 20 in LSD 7, 24-21-3w5, and 21 in LSD 11, 34-21-4w5, the latter a mile west of Major 3 producer. Home 20 is a mile north and west of Home 18 producer, and Home 21 between 2 and 3 miles farther northwest. The newly defined trend of the field is believed to extend as far northwest as 18-22-4w5.

At the same time F. A. Schultz and Associates of Calgary are testing potential extensions both east and west of 4-21-3w5, with one location in LSD 8 of that section on the east side, and a west-side location in 4-21-4w5.

Turner Valley.—In North Central Turner Valley, Royalite Oil 78, LSD 2, 2-20-3w5, has finished a large producer, with 921 bbl. initial production from the Madison at 8,270-8,744 ft.

Milburn Creek.—On the Milburn Creek structure, northwest of Turner Valley, Wesreserve 1, LSD 7, 36-23-4w5, was dry at 5,959 ft. Test was still in Belly River, an outcropping formation in parts of Turner Valley. The company is planning a seismic survey of its acreage on the Sarcee Reserve close to the Shell Exploration 4-24-J discovery well in the Jumping Pound area.

Sullivan Creek.—On the Sullivan Creek structure south of Turner Valley, Phillips Petroleum Corp. 1, LSD 3, 22-18-5w5, which got the Madison at 1,932 ft., has faulted back to Fernie at 1,982 ft. Drill is believed nearing a second Madison contact below 2,140 ft.

Coalspur.—In the Coalspur area, northern foothills, Imperial-Coalspur 1, LSD 10, 3-49-21w5, is deepening below 10,870 ft. after casing off two heavy gas flows with 7-in. at 10,431 ft.

Raymond.—In southern Alberta, Imperial-Raymond 1, LSD 7, 16-6-20w4, is nearing completion in Devonian limestone below 5,463 ft. Imperial-Stirling 1 has been located farther east in the Raymond area, in LSD 4, 15-7-19w4. Almost due north of the latter, Imperial-Tempest 1, LSD 27-9-19w4, is in Devonian below 4,947 ft. The three wells are systematically testing the Devonian limestone over a considerable area in southern Alberta.

Twin River.—In the Twin River area, southern Alberta, Western Drilling-Twin River 1, LSD 16, 3-2-20w4, is abandoning at 5,508 ft.

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MICHIGAN

Essexville Field Is Extended One-Half Mile

SAGINAW.—Bay County's Essexville field has been extended ¼ mile northwest by United Drillers & Producers, Inc. 6 Arms, Hampton Township, Section 12, the well flowing 145 bbl. a day after acid. A deep test of the field—possibly to 5,000 ft. or more, is planned by Gulf Refining Co., leading operator in the area. The deep test is scheduled for Section 16, south of United Producers 1 Walraven.

Eight of the week's 12 Michigan completions were dry holes, 5 being wildcat tests, and Isabella County's Coldwater field provided the best of the four producers, Cities Service Oil Co. 2 Rodgers coming in for 55 bbl. an hour.

The state conservation department issued six drilling permits, one each for Bay, Kent and Montmorency counties, three for Arenac.

WILDCAT FAILURES COMPLETED IN MICHIGAN

Allegan County, Fillmore Township: George Koops and Dave Schripsema 1 A. Koeman, NW NW SW 18-4n-15w, dry in Traverse limestone, TD 1,493 ft.

Watson Township: Lowell Bernhardt 1 Hulda Blair, SE NE SW 16-2n-12w, dry in Traverse limestone, TD 1,815 ft.

Clinton County, Ovid Township: McClanahan Oil Co. 1 Gertie M. Aldrich, SE SE SW 3-7n-1w, dry in Dundee, TD 2,913 ft.

Ionia County, Boston Township: C. W. Ramsey 1 Fred Nummer, NW SE NW 6-6n-8w, dry in Monroe, TD 2,550 ft.

Ronald Township: Michigan Oil Co. 1 Lyle Dickinson, NE SE SE 22-8n-6w, dry in Dundee, TD 3,026 ft.

Lake County, South Newkirk Township: Monroe Marks 1 Levitson, C W½ SE NW 26-19n-12w, dry.

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CALIFORNIA

Elk Hills Production Passes 60,000 Bbl.

LOS ANGELES.—Production of the Elk Hills field passed 60,000 bbl. per day this week and with 11 new wells scheduled for completion within the next 2 weeks, production will probably reach the objective of 65,000 bbl. daily about March 15. When the present development program was undertaken in June 1944, the Navy Department set June 1945 as the time by which daily field production should reach 65,000 bbl.

The development program which increased Elk Hills production 50,000 bbl. per day in a little over 9 months will not be stopped abruptly as the objective was the development and maintenance of 65,000 bbl. daily. This will necessitate continued drilling on a smaller scale unless the Navy Department is given authority to proceed with recommended prospecting work to definitely determine the status of undrilled acreage west of present development.

Standard Oil Co. of California, owning practically every alternate section in the Buena Vista Hills field, is greatly enlarging its development program for that field. This new work is scattered over several sections including Sections 25, 26, 27, 35, and 36 in Township 31s, Range 23e. New locations have also been made in Section 1-32s-23e. It is likely some of the drilling crews released at Elk Hills will be moved to Buena Vista Hills where there are several years of work ahead. Completion depths are somewhat similar and therefore light drilling rigs can be used to advantage. Approximately 4,500 acres have been proved to date and on the basis of one well to 10 acres this represents about 450 additional wells ar approximately 1,500,000 ft. of new hole.

Another week or so should decide the fate of several important wildcats and deep tests. Barnsdall Oil Co. is putting the finishing touches on 44 Rancho San Francisco in the Newhall Potrero field and should have this well ready for an early test. At Long Beach, Shell Oil Co., Inc. has just passed the 11,000-ft. level in 48-A Alamitos but may carry this test down to 15,000 ft. unless an oil sand is found sooner. In the Lost Hills field of Kern County, Standard is making hole in 58-4 Cahn in Section 4-27s-21e, at 7,751 ft., but has not yet landed casing below the shoe of the 16-in. cemented at 2,507 ft. This is an important deep test because if successful it will mean additional drilling on the Lost Hills structure, long considered as offering excellent possibilities for deep production. Standard has successfully surmounted the high head-water sand which several times forced abandonment of projected deep tests.

Shell's deep test at Dominguez, 135 Reyes, is drilling ahead at 11,400 ft. at which depth the formation is a sand and shale. The lower zones at Dominguez are badly faulted and therefore while several deep tests have been drilled to date it will require at least one deep test in each block to definitely determine deep-zone possibilities.

WILDCAT FAILURES COMPLETED IN CALIFORNIA

Kern County, Mount Poso district: Independent Exploration Co. 1 Heisen, 36-27s-28e, bottomed in gray sand, Vedder zone of Miocene age barren gray sand at 1,030 ft., TD 1,045 ft.

Colusa County, Princeton district: Standard 1 Davis, 36-18n-2w, bottomed in gray sand, form. test 1,870-95 ft. recovered 17 ft. mud and water, form. test 3,001-44 ft. recovered 600 ft. water, form. test 3,370-3,560 ft. recovered 3,000 ft. water slightly salty, TD 3,560 ft.

Kern County, Tejon district: Richfield 11-3 Tejon, 3-10n-19w, bottomed in gray sand, oil and gas zones absent, TD 2,901 ft.

TEXAS GULF COAST

South Hyatt Discovery Flowing 390 Bbl. Daily

HOUSTON.—Atlantic Refining Co. 1 Houston Oil-American Republics, in BBB&C Survey, northwest corner Section 3, discovery well of the South Hyatt field in Tyler County, and producing through perforations at 8,379½-82 ft., is flowing at the rate of 390 bbl. per day through ¼-in. choke, tubing pressure 2,325 lb., gas-oil ratio 4,700 to 1. Gravity reported 58.9°, dark straw-colored condensate. On a preliminary test earlier in the week the well had flowed at the rate of 10.82 bbl. an hour through 3/16-in. choke, tubing pressure 2,400 lb. with gravity reported at that time as 46.5°. Gravity is expected to drop some as testing continues. No water was reported in the flow. Total depth of the hole is 9,015 ft., with 5½-in. casing set to 8,675 ft.

Navarro Oil Co. 1 Foster Lumber Co., Wilcox discovery in George Taylor Survey, south of Cold Springs in San Jacinto County, testing in perforations at 7,906-10 ft. flowed 83.04 bbl. daily pipeline oil through 5/32-in. choke, 880,000 cu. ft. of gas a day, tubing pressure 1,850 lb., casing pressure 2,050 lb. gravity 36.5°. Total depth is 7,960 ft. with casing set on bottom. Rig is being moved and installed at the 2 Foster, southwesterly offset to the producer.

Morris-Hamilton Drilling Co. 2 Bryan-Chapman, new deep sand well at Goose Creek in Harris County, flowed 57.75 bbl. daily through ⅛-in. choke, gas-oil ratio 180 to 1, tubing pressure 125 lb., casing pressure 140 lb., gravity 26.4°, no water, on Railroad Commission gage. Sand was topped at 4,330 ft., total depth 4,339 ft., with 5½-in. casing set to 4,330 ft. with screen opposite the pay section, 2-in. tubing about 4,301 ft.

General Crude Oil Co. 17-B (formerly 1-C) Sun-Stanolind, F. M. Gardner Survey, extension to South Esperson field in Liberty County, is flowing into pits at the rate of 5 bbl. an hour through ⅛-in. choke, tubing pressure 825 lb., 3.8 per cent mud in the flow, gravity of oil 35.1°. Total depth is 6,040 ft., 5½-in. casing on bottom and production is from perforations 30 holes at 5,940-45 ft.; 90 holes at 5,955-70 ft., and 60 holes at 5,975-85 ft. General Crude has staked location for 18-B Sun-Stanolind (Esperson "B") 1,000 ft. west of the 17-B extension producer. Contract depth is 7,500 ft.

Dillard & Waltermire 1 Ed. Batla et al, wildcat in Louis Von Roeder Survey, about 3 miles northwest of Cat Springs, in Austin County, is dry at 8,997 ft. after failing to find anything of interest in the Cockfield or Wilcox zones. Top of Cockfield reported at 4,260 ft.

WILDCAT FAILURES IN TEXAS GULF COAST

Austin County: Dillard & Waltermire 1 Ed. Batla et al, 3 mi. NW of Cat Springs in Von Roeder Sur., dry at 8,997 ft.

Fayette County: Continental Oil Co. 1-A E. A. Arnim, Jr. et al, 5 mi. NW of Flatonia in A. Zumwalt Sur., dry at 5,335 ft.

Harris County: ElTex, Ltd. 1 Westmore-

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land Farms, 1½ mi. W of Bellaire, in Caleb McKenzie Sur., dry at 7,520 ft.

EASTERN TEXAS

Freestone County Distillate Discovery Completed

DALLAS.—The Texas Co. 1 W. A. McKnight, distillate discovery in the I. H. Reed Survey, 2½ miles southwest of Fairfield, Freestone County, has been completed through perforations from 8,232-47 ft. and 8,275-97 ft. in Travis Park. Initial production is 14,500,000 cu. ft. gas, open flow, in 24 hours with 30 bbl. of distillate per million cubic feet of gas. Humble Oil & Refining Co. 1 S. T. Stanley, Vaughn Survey, in the Larissa area of northwestern Cherokee County, tested through perforations from 9,570-9,699 ft. and flowed 71 bbl. of fluid, 65 per cent oil and 35 per cent wash and acid water, in 24 hours. Total depth is 10,737 ft.

Humble 1 New Birmingham, Jordan Survey, 5 miles southwest of Rusk in Cherokee County, was drilling below 9,143 ft. with no shows. At Humble 1 Jones, K. H. Douglas Survey, wildcat in the Eustace area of northwestern Henderson County, an electrical survey was run to 7,360 ft., with show of porosity from 7,340-60 ft. Later a drill-stem test was made from 7,335-79 ft. and recovered 1,100 ft. of salt water with no shows of oil or gas. It is drilling below 7,379 ft. in lime and shale.

A new wildcat for southeastern Panola County is W. H. Mitchell 1 Forders Unit, 660 ft. from the northeast and southeast lines of the A. G. Hudson Survey, 5 miles southwest of Deadwood. Magnolia Petroleum Corp. has staked a wildcat, 1 W. L. Harrell, 330 ft. from the north and east lines of a 157.44-acre tract, Wm. Wray Survey, 2½ miles southwest of Waterman, Nacogdoches County.

SUCCESSFUL WILDCAT COMPLETION IN EASTERN TEXAS

Hopkins County: Pool extension—Hunt Oil 1 M. C. Spigner, Jonathan Fowler Sur., 2 mi. SW Pickton, elev. 432 ft., Paluxy 6,340 ft., upper Glenrose 6,674 ft., flowed 389 bbl. day throug 3/16-in. choke from perf. 7,892-7,903 ft. Bacon, gravity 50.8°, gas-oil ratio 1,280 to 1, TD 7,969 ft.

WILDCAT FAILURES COMPLETED IN EASTERN TEXAS

Harrison County: Gregg-Texas & Hanlon 1 Travis Page, Hedley White Sur., 4 mi. NW Hallsville, elev. 400 ft., massive anhydrite 6,350 ft., Pettit 7,345 ft., dry, TD 7,502 ft.

Henderson County: Hyde & Wiggins 1 Faulk & Coleman, A. W. Brown Sur., 2½ mi. NW LaRue, elev. 472 ft., Woodbine 2,868 ft., dry, TD 3,320 ft.

Shelby County: Southport Pet. 1 R. C. Poore, Blk. 10, Holmes Byfield Sur., 4 mi NW Timpson, elev. 387 ft., dry, TD 6,910 ft.

SOUTH LOUISIANA

North Cowley Test Flows Potential of 160 Bbl. Daily

NEW ORLEANS.—Vincent & Welch 3 L. Harmon, 28-8s-1e, at North Crowley, in Acadia Parish, flowed potential of 160 bbl. day on ⅛-in. choke, gas-oil ratio 516 to 1, gravity 36.3°, from perforations at 7,141-43 ft. Total depth is 7,173 ft.

Stanolind Oil & Gas Co. 1 W. H. Tupper, 29-7s-3w, at South Elton field, Jefferson Davis Parish, recovered 24 stands of 37.4°-gravity oil on drill-stem test at 8,070-87 ft. Total depth is 9,255 ft., hard shale and lime. Now waiting on cement to set after setting 7-in. casing to 9,254 ft.

Tide Water Associated Oil Co. et al 1 Lussier, 50-12s-14e, at Napoleonville field, Assumption Parish, which flowed dry gas on test in perforations at 9,800-02 ft, has made additional perforations, 100 shots, from 9,796-9,806 ft., and is preparing to retest.

Gulf Refining Co. 1-C M. Gray et al, 15-15s-14w, wildcat in the Johnson Bayou area of Cameron Parish, is preparing to drill plug from the 9⅝-in. casing set at 8,545 ft.

WILDCAT FAILURE COMPLETED IN SOUTH LOUISIANA

Calcasieu Parish: Magnolia Petroleum Co. 1 O. B. Crozier, West Lockport area, 13-10s-10w, dry at 9,583 ft.

N. CENTRAL TEXAS

Jack County Gets Bend Conglomerate Discovery

WICHITA FALLS.—Panhandle Producing & Refining Co. 1 Cherryhomes, R. S. Gordon Survey, 5 miles southeast of Jacksboro, is a new Bend conglomerate discovery well for southeastern Jack County. A 5½-in. casing was cemented at 5,091 ft. Casing was perforated from 5,035-50 ft. The well was swabbed 4 hours and kicked off and flowed into pits. It was shut in for 6 hours, but when opened would not flow. After being swabbed twice, the well kicked off again and flowed 37 bbl. oil in 1 hour through ¾-in. choke. Testing will continue.

Consolidated Oil Co. 1 Jones-Payne, 1 mile west of the Madden pool in southern Wichita County, is drilling below 5,138 ft. in lime. Continental Oil Co. 1 Thomas, Freestone County School Lands, 2 miles north of Newport in southeastern Clay County, made a 30-minute drill-stem test from 4,145-53 ft. and recovered 100 ft. of free oil and 110 ft. of heavily oil-cut mud with bottom-hole pressure of 1,600 lb. It is drilling ahead at 4,369 ft. in shale.

Shell Oil Co., Inc. 1 J. H. Huffman, TE&L Survey, wildcat 1 mile west of Jean in northern Young County, took a 30-minute drill-stem test from 3,153-62 ft. and recovered 35 ft. of free oil. It is drilling below 3,800 ft. in shale. Shappell Oil Co. 1 Zelma Roberts, Parker County School Lands, a wildcat 5 miles southeast of Petrolia in Clay County, is dry at 2,008 ft. in sandy shale. The test logged sand showing oil from 310-325 ft. and from 1,954-70 ft., but logged water sand from 1,970-85 ft.

SUCCESSFUL WILDCAT COMPLETIONS NORTH CENTRAL TEXAS

Clay County: Pool extension—L. T. Burns 5 A. L. Browning, Blk. 70, J. H. Belcher Sur. A-743, ½ mi. W Deer Creek, pumped 51 bbl. day, TD 4,086 ft.

Jack County: New discovery—James Stewart 1-D J. W. Kinder, B. H. Epperson Sur. A-208, 7 mi. S Bryson, flowed 90 bbl. through 16/64-in. choke, top pay 4,204 ft., Marble Falls, gravity 40°, gas-oil ratio 500 to 1, TP 200 lb., Mississippian 4,540 ft., TD 4,655 ft.

Montague County: New pay—Continental 1-B J. M. Hundley, D. Martindale Sur. A-465, elev. 969 ft., IP 25 bbl. day from perf. 5,688-5,720 ft., Strawn, TD 6,450 ft.

Wichita County: Pool extension—Continental 1 Mae Johnson, G. W. Scott Sur. A-254, 2 mi. W Wichita Falls,

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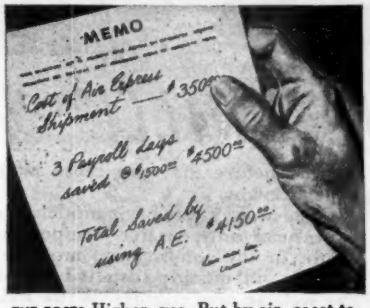

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pumped 209 bbl. day through perf. 4,355-69 ft., 41° gravity, TD 4,269 ft.

Young County: New pay—Standard of Ohio 2 J. R. Garvey, Sec. 1, BBB&C Sur. A-35, 4 mi. N Farmer, elev. 1,132 ft., Bend 4,428, Marble Falls 4,945 ft., Mississippian 5,162 ft., flowed 465 bbl. day through ½-in. choke, gravity 45.9°, gas-oil ratio 900 to 1, TD 4,340 ft.

WILDCAT FAILURES COMPLETED IN NORTH CENTRAL TEXAS

Archer County: D. H. Bolin 1 Mary A. Garvey, Lot 94, Jefferson CSL, 3 mi. N and 2 mi. E Anarene, dry, TD 1,235 ft.

G. E. Kadane & Sons 1 Oil Investment Co., Blk. 126, J. W. Harris subd. of Club Ranch, 6 mi. N and 2 mi. W Archer City, elev. 987 ft., dry, TD 1,509 ft.

C. Y. Gorman 1 Frank Case et al, John Smith Sur. A-377, 4 mi. S and 2 mi. W Holliday, elev. 1,042 ft., dry, TD 1,645 ft.

Clay County: F. H. Gholke 1 G. W. Byers & Co., Blk. 8, Byers Bros. subd., 1 mi. S Petrolia, elev. 962 ft., dry, TD 1,816 ft.

Stanolind 1 Cray, Blk. 2801, TE&L Sur. A-531, 3 mi. S Bellevue, dry, TD 3,040 ft.

Cooke County: G. E. Kadane & Sons 1 W. L. Parker, P. G. Yarborough Sur. A-1175, 1 mi. E Hood, dry, TD 1,567 ft.

Kerlyn Oil 1 H. C. Hay, Amos C. C. Bailey Sur. A-44, 2 mi. E Gainesville, elev. 788 ft., Ellenburger 3,837 ft., dry, TD 4,080 ft.

SUCCESSFUL WILDCAT COMPLETIONS IN WEST CENTRAL TEXAS

Jones County: New discovery—Hunt Oil 2 T. J. Amason, subd. 2, S. Jones Sur. A-266, 3 mi. NE Noodle, elev. 1,782 ft., pumped 126 bbl. day through 2-in. tubing, top pay 3,592 ft. Canyon, gravity 40 , TD 3,608 ft.

Shackelford County: New discovery—Craighead & Montgomery 1 Clausell Est., TE&L Sur. No. 587, 3 mi. NE Albany, pumped 22 bbl. day, TD 550 ft.

WILDCAT FAILURES COMPLETED IN WEST CENTRAL TEXAS

Coleman County: Maguire Ind., Inc. and Sohio 1 J. P. Morris Est., W. B. Roddan Sur., 3 mi. NW Novice, elev. 1,993 ft., dry, TD 3,858 ft.

Taylor County: Onyx Refg. and Ungren & Frazier 1 Minnie Bowles, Sec. 25, Blind Asylum land, 2 mi. NE Abilene, elev. 1,720 ft., King 2,020 ft., dry, TD 2,150 ft.

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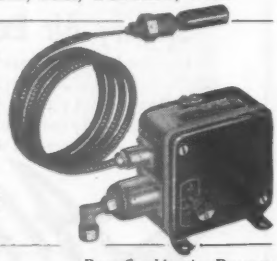
Magneto Ignition Applications. Sounds an alarm only . . . grounds dual magneto . . . grounds magneto only . . . grounds magneto and sounds an alarm or lights a signal light.

Dual Ignition Applications. Opens battery circuit and grounds magneto.



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ILLINOIS

Cowling Pool Well Starts At 80 Bbl. Per Hour

CENTRALIA.—The Cowling pool in Edwards County had the best-looking well of the recent crop of Illinois producers when George Wickham 2 J. Schroeder, SE SE NE 27-2s-14w, in a production test of McClosky lime flowed 80 bbl. in 1 hour and 750 bbl. in 18 hours. McClosky lime laid at 2,963-73 ft. It was not yet a completion.

Eighteen of the 23 new oil wells in Illinois reported in the past week averaged only 45 bbl. per day per well, but 5 other wells with comparatively large production brought the total average per well up to 115 bbl. per well.

In the Willow Hill pool in Jasper County, opened late in 1945, Pure Oil Co. 1 Schott Consolidated-A, NE SE SE 34-7n-10e, flowed 141 bbl. the first 3 hours from McClosky lime at 2,661-75 ft. and later flowed 641 bbl. in 24 hours through 1-in. choke on tubing. It had not been acidized. Same company's 1 H. Dhom, NE NE SW 34-7n-10e, had McClosky lime at 2,668-72 ft. and 2,714-21 ft. It pumped 162 bbl. in 24 hours, without acid treatment.

In the Bible Grove pool, which lies in Effingham and Clay counties, Leland Waggoner 1 M. Wood, SE SW SE 28-6n-7e, Effingham County, swabbed and flowed 528 bbl. in 24 hours from McClosky lime at 2,863-68 ft. It had not been acidized.

Only three wildcats were completed during the week, one of them a 42-bbl. well which extended the Clay City pool in Wayne County. The two others were dry. A. R. Florian, in an effort to extend the Dix pool from Jefferson into Marion County, found no showings of oil in Benoist or Aux Vases sands and found the McClosky lime entirely missing.

Only 18 new operations were started, including three wildcats: Pure Oil Co. 1 Heidlage, SW SW NE 21-5n-10e, Jasper County; M. C. Freeman and J. H. Williams 1 Joe Droll, SW SW SE 33-4s-3e, Jefferson County, and Pittsburgh & Fairmont Coal Co. 1 M. Land, NW NW SE 25-5s-9e, White County.

SUCCESSFUL WILDCAT COMPLETION IN ILLINOIS

Wayne County: Pure 1 E. E. Grubb-A, SW SE SW 4-1s-8e, Rosiclare lime 3,122-26 ft., TD 3,269 ft., acidized, pumped 42 bbl. of oil, 5 bbl. of water. Extends the Clay City field.

WILDCAT FAILURES COMPLETED IN ILLINOIS

Marion County: A. R. Florian 1 March, SW SE NE 35-1n-3e, dry at 2,384 ft., Menard 1,539 ft., Cypress 1,960 ft., Benoist 2,111 ft., Aux Vases 2-183 ft., Fredonia 2,317 ft., no McClosky lime.

Wayne County: Pure 1 A. A. Smith-A, SE SE SE 17-1s-9e, dry at 3,337 ft., Menard 2,450 ft., Cypress 2,888 ft., Aux Vases 3,160 ft., McClosky 3,269 ft. Drill-

stem test recovered only mud and salt water.

ROCKY MOUNTAIN

Wildcat Program Started In Eastern Colorado

DENVER.—Location for the first of several important wildcats to be drilled in eastern Colorado has been released by the Union Oil Co. of Colorado in its 1 Kroell, SE NW NW 27-21s-46w, on the East May Valley structure in Prowers County, 8 miles north of Lamar. Operations will begin April 1 and it will test all horizons down to the Ordovician. It is on a block of 12,000 acres. Location is 10 miles north of Trojan Oil & Gas Co. 1 Lotus, drilled in 1935 to 5,913 ft., and which had shows of oil in the Fort Scott lime at 4,019-33 ft., and at 3,954-61 ft. in lime, the latter consisting of green oil of 37° gravity. It also is 9 miles south of the old Nee-No-She well which had several good shows before the hole was lost, and 10 miles southeast of the Indian Territory 1 Arbes, which went to 5,631 ft. and tested the Mississippian.

Shallow gas at Winkelman.—Stanolind Oil & Gas Co. 5 Shoshone-Arapaho, SW NE NW 19-2n-1w, Winkelman dome, Fremont County, Wyoming, had rig destroyed by fire at 1,163 ft., leaving the tools in the hole. Well was plugged back to 745 ft. and completed for 600,000 cu. ft. of gas per day through perforations at 502-738 ft. in what probably is the Dakota sand.

Alkali Creek test down structure.—Mountain Fuel Supply Co. 1 Unit, C SE SW 18-13n-99w, Alkali Creek structure, Sweetwater County, Wyoming, was abandoned in the Wasatch at 3,574 ft. without reaching its objective. It was located on the west side of a major north-south fault and was found to be running low. Tentative plans are to drill another test on the east side of the fault where the old Prairie Oil & Gas Co. drilled in 1928 and found gas at 3,625 ft., but abandoned the test on account of the lack of a market.

Lost Soldier extension.—Sharples Corp. 1 Government, NW NE NW 14-26n-90w, Lost Soldier field, Sweetwater County, Wyoming, on a tract leased at auction last year, swabbed 542 bbl. in 24 hours from the Tensleep at 5,916-6,087 ft., and extends the proven area 1¼ miles to the southeast. Wells on approximately the same contour have been drilled by Sinclair-Wyoming Oil Co. on the north and northwest flanks.

Water in Tensleep at Oil Mountain.—The Texas Co. 1 Clark, NE NE SW 35-33n-82w, Oil Mountain structure, Natrona County, Wyoming, which had shows of oil with low pressure in the Tensleep, topped at 2,628 ft., tested the Madison at 3,326 ft., total depth, then plugged back to 2,817 ft. to test the Tensleep. It swabbed 875 bbl. of water with rainbows of oil at 2,680-90 ft.

Dyer awarded Lake Creek leases.—Federal leases on 888 acres on the Lake Creek structure, Hot Springs County, Wyoming, have been issued to J. G. Dyer, of Denver, who was high in sealed bids submitted to the General Land Office last September, and tentative plans call for a Tensleep test this spring. Dyer, formerly vice president of Continental Oil Co. in charge of production, now is an independent operator in the Rocky Mountain area.

WILDCAT FAILURE COMPLETED IN NORTHWEST NEW MEXICO

Fidel district, Velencia County: Carroll & Cornell 1 State, NW SW NE 36-11n-8w, TD 1,167 ft. in Morrison, top of Dakota 1,050 ft., dry.

SUCCESSFUL WILDCAT COMPLETION IN WYOMING

Lost Soldier, Sweetwater County: Sharples Corp. 1 Government, NW NE NW 14-26n-90w, TD 6,087 ft., 7-in. 5,916 ft., swabbed 542 bbl. from Tensleep in 24 hours, 1¼-mi. extension on south flank.

WILDCAT FAILURES COMPLETED IN WYOMING

Spence, Big Horn County: Chase Brothers 2 State, NE NE NW 16-54n-94w, TD 902 ft., dry in Madison.

Alkali Creek, Sweetwater County: Mountain Fuel Supply Co. 1 Unit, SE SW 18-13n-99w, TD 3,574 ft., abandoned in Wasatch, down structure.

SUCCESSFUL WILDCAT COMPLETION IN MONTANA

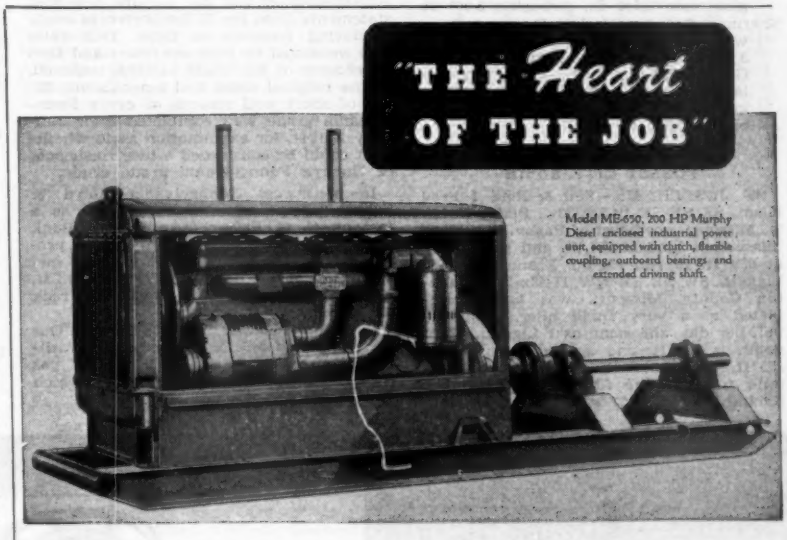
Brady, Pondera County: Texas Co. 3 Schlepp, NW SE SE 21-27n-2w, TD 1,479 ft., Sunburst 1,462-96 ft., show of oil at 1,488-95 ft., shot with 60 qt., swabbed ¼ bbl. oil per hour, northwest offset to small discovery in 1 Weikum.

KANSAS

Trego County Test Makes 50-Bbl. Well

HARBAR DRILLING CO. et al 1 Cotton, SW SW NE 15-12-21w, just south of Ogallah pool in Trego County, promises to make a small producer from the Arbuckle. Lime was cut at 3,605 ft., and Arbuckle at 3,960 ft., where 5-in. pipe was set. At total depth 3,978 ft., the well made 2 bbl. of oil per hour, 38° gravity. After acidizing with 2,000 gal., the well made an estimated 50 bbl.

In Graham County, the Winkler-Koch Engineering Co. 1 Faulkner, SW SE SE 27-10-22w, is swabbing oil from the Marmaton. Lime was cut at 3,550 ft., Marma-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ton at 3,807 ft., Simpson 3,956 ft., and Arbuckle at 3,962 ft. Perforations were made at 3,884-92 ft., and operators swabbed 10 bbl. oil per day. Acidizing with 1,200 gals. increased the yield to 25 bbl. per day.

Two pool wells were given maximum potentials this week. Phillips Petroleum Co. 1 Spani, NE NW NE 36-20-14w, extension to the Hiss pool in Barton County, and Stanolind Oil & Gas Co. 8 Johnson, SW NW NE 31-23-10w, in the Zenith pool of Reno County, were both given a potential of 3,000 bbl. per day.

WILDCAT FAILURES COMPLETED IN KANSAS

Barber County: Huber 2 Buck, NE SW NE 35-30s-14w, elev. 1,707 ft., dry, TD 4,468 ft. Kansas City 3,811 ft., Mississippi chat 4,319 ft., Maquoketa 4,387 ft.

Barton County: Kiowa Drilling 1 Asher "A," SE SE NE 20-20s-14w, dry, TD 3,617 ft., Kansas City 3,289 ft., conglomerate 3,540 ft., Arbuckle 3,567 ft.

Sherman County: Sinclair Prairie 1 Cogswell, SW SW SW 20-10s-38w, elev. 3,517 ft., dry, TD 5,540 ft. Council Grove 3,728 ft., Tarkio 4,000 ft., Douglas 4,363 ft., Lansing 4,450 ft., Cherokee 4,876 ft., Mississippi 4,997 ft., Arbuckle 5,382 ft.

FOREST CITY BASIN

ST. JOSEPH, Mo.—Fell & Reid 1 Fred Klam, SE SE SE 19-51n-33w, Platte County, Missouri, northeast of Parkville, topped Mississippi lime at 957 ft. and shut down at 959 ft. to run casing. Francis et al 2 Liggett, SW SE SE NW 11-48n-31w, Jackson County, Missouri, was being completed as a very small oiler, about ½ bbl. per day, the same as 1 Liggett. Total depth is 255 ft. and a sand from 233 to 255 ft. was shot with 12 sticks of dynamite to start the flow. Kelley et al 1 Krohne, SW SW 31-9s-23e, near Lansing in Leavenworth County, Kansas, was drilling at 78 ft. in a 10-in. hole.

WILDCAT FAILURE COMPLETED IN NEBRASKA

Gage County: Gage Development 1 Staneshezk, NW NW NW 24-1n-6e, elev. 1,379 ft., dry, TD 2,762 ft.

APPALACHIAN FIELD

New-Well Statements Not Required for Ohio

PITTSBURGH. — Notification has been received from Washington that in agreement with Defense Supplies Corp., the petroleum branch of Office of Price Administration will not require new-well statements from the 18 Pennsylvania crude producing counties of Ohio. This news was welcomed by both operators and first purchasers of the crude as OPA required, in the original order and amendment, filing of short well records of every Pennsylvania grade well completed after January 1, 1944, for examination as to whether it could be considered a new flush pool of Buckye Pennsylvania grade crude.

In southwest Pennsylvania, Boyd & Schupp completed a fair gas well as a test on C. C. Fisher farm in Red Bank Township, Armstrong County, and presumably in the Murraysville sand. It had an initial open flow of 2,000,000 cu. ft. and was turned in the lines. The rock pressure was not reported.

In Indiana County, Peoples Natural Gas Co. completed 2 J. & J. Wallace in Washington district with 284,000 cu. ft. of gas from a sand at 2,942-47 ft., and which

(Continued on page 113)

MISSISSIPPI

Baxterville Field Is Extended by Superior

JACKSON, Miss. — The new Baxterville field in Lamar County, opened last summer by the Gulf Refining Co. 1 Cooper well, has received a probable southeast extension by the Superior Oil Co. 1 Batson et al, NW NE SW 17-1n-16w. A drillstem test at 7,612-62 ft. received mud and water cushion, cut with gas and condensate. Cores at 8,668-8,728 ft. and 8,786-8,846 ft. received porous sand saturated with heavy black oil.

Nine field wells and two wildcat tests were completed this week, eight of the field wells being successful. One field test and the two wildcats were dry. Best of the new oil wells was completed in the Cranfield field, flowing 384 bbl. per day through 9/64-inch choke. It was the California Co. 2 Ratcliffe, 68-7n-1w, and had top of Massive sand, the producing formation, at 10,254 ft.

WILDCAT FAILURES COMPLETED IN MISSISSIPPI

Copiah County: Sinclair-Wyoming 1 Johnson, SE NE NE 1-9n-10e, elev. 227 ft., dry, TD 10,663 ft., Eutaw 8,633 ft., Tuscaloosa 9,140 ft., Marine Tuscaloosa 9,750 ft., Massive 10,050 ft., Lower Cretaceous 10,103 ft.

Yazoo County: Sinclair-Wyoming 1 Ingram, NE SW 17-12n-1w, elev. 276 ft., dry, TD 6,516 ft., Eutaw 5,796 ft., Tuscaloosa 6,430 ft.

WILDCAT FAILURE COMPLETED IN ALABAMA

Choctaw County: John Green 1 Dawsey, SW SE 29-10n-4w, dry, TD 4,310 ft. Driller tops, chalk 2,666 ft., Eutaw 3,740 ft.

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OKLAHOMA

Lower Allowable Did Not Prevent Pressure Drop

RESERVOIR pressure in the West Edmond field of Oklahoma, Kingfisher, Canadian and Logan counties continued to decline in spite of the reduced per-well production allowable from 200 bbl. to 150 bbl. per well per day. A study of the results of the recent survey of the field made on 111 key wells out of more than 400 producing wells in the area, shows that average bottom-hole pressure was 84 lb. less than shown by the tests made in November 1944.

The production of the field in the period between the two tests was 4,478,520 bbl. which brought the total production up to February 22 to 10,606,520 bbl.

Continental Oil Co. 1 Dotson, SW NW NE 7-2s-3w, Carter County, drilled to 6,487 ft. and then plugged back to a sand at 6,309-80 ft., and in production tests showed for a 400-bbl. well. It was not a completion.

Anderson-Prichard Oil Corp. 3-A Prentice, C NW SW 6-5n-9w, in the Cement field in Caddo County, tested 60 bbl. of oil per hour from Medrano sand at 5,766-5,818 ft. Henry Schafer, Inc., et al drilled to 9,200 ft. in their 1 Cook, a wildcat, NE SE NE 35-5n-9w, and the crew was reported preparing to run pipe to the bottom. This well showed good saturation at 8,830-9,107 ft.

The shallow-sand Northeast Hobart field in Kiowa County yielded its second producer, Pure Oil Co. 2 Hinton-A, NW SE NW 10-7n-17w, which swabbed 14 bbl. of oil per hour after an acid treatment in the conglomerate pay at 1,715-82 ft.

WILDCAT FAILURES COMPLETED IN OKLAHOMA

Garfield County: Texas 1 School Land "F," SW SW SW 13-21n-4w, elev. 1,133 ft., dry, TD 6,718 ft. Oswego 5,050 ft., Prue 5,468 ft., May 5,645 ft., Woodford 6,005 ft., Viola 6,100 ft., Wilcox 6,215 ft., Second Wilcox 6,300 ft., Arbuckle 6,595 ft.

Garvin County: Fox & Fox 1 Powell, SE NE 2-2n-2w, elev. 1,105 ft., dry, TD 6,220 ft., Basal Penna & Haragan-Henryhouse (No Bois d'Arc) Hunton 6,060 ft.

Hughes County: Mid-Continent 1 Meaders, SE SW NW 20-9n-11e, elev. 700 ft., dry, TD 4,065 ft., Cromwell 3,100 ft., May 3,550 ft., Woodford 3,750 ft., Hunton 3,780 ft., Sylvan 3,855 ft., Viola 3,935 ft., Wilcox 4,049 ft.

Seminole County: Schermerhorn 1 Tiger, SW SE NE 19-10n-7e, elev. 952 ft., dry, TD 3,930 ft., Booch 3,665 ft., Gilcrease 3,738 ft., Cromwell 3,815 ft.

SUCCESSFUL WILDCAT COMPLETIONS IN OKLAHOMA

Canadian County: West Edmond Extension. Fox & Fox 1 Roush, NE NW 1-14n-5w, elev. 1,134 ft., flowed 450 bbl. in 24 hr., 3/32-in. choke, perf. 7,050-72 ft., TD 7,125 ft. Oswego 6,453 ft., Prue 6,545 ft., Bartlesville 6,700-25 ft., May 6,811 ft., Woodford 6,954 ft., Bois d'Arc 7,005 ft., Haragan 7,073 ft.

Lincoln County: DISCOVERY. Mid-States 1 Barnes (OWWO) SW SE 19-13n-5e, elev. 867 ft., pumped 18 bbl. oil, 80 bbl. water in 24 hrs., perf. 3,640-55 ft., OTD 5,001 ft., PBTD 3,669 ft., Prue Sand 3,650-95 ft.

Noble County: DISCOVERY. Sunray 1 Robideaux, SW NE NW 22-22n-1e, elev. 1,026 ft., pumped 20 bbl. oil and 120 bbl. water in 24 hrs., Layton sand pay 3,337-50 ft. TD 3,353 ft., PBTD 3,350 ft., Top Layton 3,335 ft.

Oklahoma County: DISCOVERY. Gulf 1 Beck, SW SW SW 5-14n-2w, elev. 1,059 ft., flowed 70 bbl. oil and 6 bbl. water in 24 hrs., after 13,000 gal. acid treatment, from perf. in Hunton at 5,760-5,804 ft., and 5,824-49 ft., TD 6,208 ft. Bartlesville 5,696 ft., Basal Penn. & Hunton 5,755 ft., Sylvan 5,843 ft., Viola 5,946 ft., Wilcox 6,093 ft., Second Wilcox 6,175 ft.

Payne County: DISCOVERY. Hanlon-Buchanan 1 Heiring, SE SE SE 18-19n-2e, elev. 909 ft., flowed 100 bbl. 42° gty. oil in 24 hrs., 5/64-in. choke, 1% water, from Misener sand 4,528-47 ft., TD 4,547 ft. Oswego 3,960 ft., Bartlesville 4,230 ft., May 4,385 ft., Woodford 4,520 ft., Misener 4,545 ft.

Stephens County: DISCOVERY. Magnolia 1 Jones Heirs, NW SE 21-1n-4w, elev. 1,116 ft., pumped 150 bbl. oil in 24 hrs., 21° gty. Sand pay 5,535-83 ft., TD 5,583 ft.

WILDCAT COMPLETIONS AND DISCOVERIES

	Week ended Mar. 3, 1945					Cumulative total, 1945				
	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ohio	0	0	1	0	1	0	0	4	11	15
Indiana	0	0	0	0	0	0	0	0	2	2
Illinois	1	0	0	2	3	11	0	0	41	52
Kentucky	0	0	0	0	0	2	0	1	9	12
Michigan	0	0	0	5	5	1	0	0	37	38
Kansas	0	0	0	3	3	5	0	3	64	72
Neb., Mo., Iowa	0	0	0	1	1	0	0	0	7	7
Oklahoma	6	0	0	4	10	21	0	2	44	67
Texas:										
North Central	7	0	0	9	16	27	0	2	80	109
West	2	0	0	5	7	6	0	0	53	59
Panhandle	0	0	0	1	1	0	0	0	2	2
Eastern	1	0	0	3	4	4	0	0	15	19
Gulf Coast	2	0	0	5	7	9	1	8	49	67
Southwest	0	0	0	2	2	3	0	3	37	43
Total Texas	12	0	0	25	37	49	1	13	236	299
Louisiana:										
Northern	1	0	1	2	4	1	0	1	14	16
Southern	0	0	0	1	1	4	0	0	7	11
Total Louisiana	1	0	1	3	5	5	0	1	21	27
Arkansas	0	0	0	1	1	0	0	0	13	13
Mississippi	0	0	0	2	2	1	0	0	18	19
Ala., Ga., Florida	0	0	0	1	1	0	0	0	4	4
Montana	1	0	0	0	1	3	0	0	3	6
Wyoming	1	0	0	2	3	6	0	0	7	13
Colorado-Utah	0	0	0	0	0	0	0	0	3	3
New Mexico	1	0	0	4	5	3	0	0	16	19
California	0	0	0	3	3	0	0	1	36	37
Total United States	23	0	2	56	81	107	1	25	572	705
Total previous week	11	0	1	73	85					

OHIO, KENTUCKY

New Berea Pool Indicated In Hocking County

COLUMBUS.—A new Berea pool is indicated by the Preston Oil Co. 253 Sunday Creek Coal Co., Section 2, Starr Township, Hocking County. Drilling was stopped 5 ft. in the sand at 1,162 ft. with a gage of 1,240,000 cu. ft. and 370 lb. pressure. Another location has been staked southeast of the well.

Ohio Fuel Gas Co. 1 E. I. Ganyard, Lot 60, Granger Township, Medina County, was acidized in the Clinton shell from 3,470-3,482 ft. and gaged 2,500,000 cu. ft. in 15 hours. A further test will be made before completion.

The Granger pool was extended over into Summit County by the Wiser Oil Co. 1 E. I. Ganyard, Lot 41, Bath Township. Shell at 3,495-3,511 ft. gaged 562,000 cu. ft. with rock pressure of 1,030 lb.

SUCCESSFUL WILDCAT COMPLETION IN OHIO

Hocking County, Starr Township: New gas pool discovery—Preston Oil 253 Sunday Creek Coal Co., Sec. 2, Berea 1,157-1,162 ft. (S.I.S.) 1,240,000 cu. ft. gas, TD 1,162 ft.

LA.-ARK.

New Big Oil Well for Haynesville Extension

SHREVEPORT.—Four new oil wells were added to North Louisiana fields this week, the largest of which was Midstates Oil Corp. 1 Winn-Kendrick-Mayfield, 589 ft. south and 588 ft. west of NE NW 35-23n-8w, in the Haynesville Extension. This well made 939 bbl. per day from the Pettit at 5,600-12 ft. Total depth was 5,690 ft.

Formal completion of another Delhi producer was made in the C. H. Murphy, Jr. et al 1 Barrier, NW SW 22-17n-9e, which made 209 bbl. per day from the Paluxy at 3,258-62 ft. The Lisbon field added another well in the Union Producing Co. 1 King et al, 50 ft. north of center of NE SE 17-21n-4w, initial production being 61 bbl. from the Travis Peak at 5,228-30 ft. The fourth oiler was J. P. Owens 2-E Farmer, approx. NE NE NE 5-13n-13w, in the Holly pool, making 50 bbl. from 2,820-31 ft.

SUCCESSFUL WILDCAT COMPLETIONS IN NORTH LOUISIANA

Caddo Parish: Phillips 1 Moneyham, NE NW 5-18n-16w, 73 bbl. from pay zone 5,854-59 ft., TD 6,512 ft.

Red River Parish: Texas 1 Russ, NW SE 16-12n-10w, 20,000,000 cu. ft. gas from Rodessa pay 5,000-20 ft., TD 7,197 ft.

WILDCAT FAILURES COMPLETED IN NORTH LOUISIANA

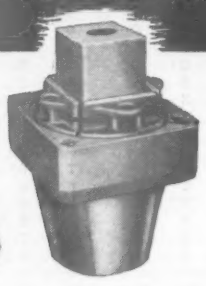
Madison Parish: Sohio 1 Harper, SE SE SW 2-16n-13e, dry, TD 6,752 ft.

Natchitoches Pairish: California 1 Morrison et al, NE NE 12-13n-8w, dry, TD 5,323 ft.

WILDCAT FAILURE COMPLETED IN ARKANSAS

Miller County: Atlantic 1 Montana Realty, NE SE 17-17s-28w, dry, TD 1,006 ft.

DRIVING TORQUE CUSHIONED WITH



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'BESTOLIFE—the Lead Seal Joint Compound used successfully in the Drilling and Refining Industries for years—is immediately available through more than 100 distributors in the U.S.A. Any priority rating will do.

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Among the

Drilling Contractors

Turner Drilling Co. will drill the Pure Oil Co. A-4 Dan Richards, in C N½ NW SW 20-18n-10w, Osceola County, Michigan.

Alberta Drilling & Development Co. is nearing completion of a 4,000-ft. test in NE¼ 21-11-29w3, near Maple Creek, Saskatchewan. Test is making hole below 3,758 ft. with a small flow of gas and a little oil, after casing to 3,750 ft.

Newell & Chandler, Calgary, are starting a joint test for Mid-Continent Oil & Gas Co. and East Crest Oil Co. in LSD 2, 8-6-15w4, in the Conrad field, southern Alberta. Rotary tools are being used.

Henry Hendrix, contractor of Evansville, Ind., has been awarded contract to drill the Paul Rossi & Farm Bureau Oil Co. 2 Elizabeth Esche, in SE SE 19-6s-12w, Posey County, Indiana.

Ralph M. Perry is contractor on the Clifford A. Perry 1 W. Naber & B. Kortering, in SE NW SE 35-5n-15w, Ottawa County, Michigan.

Noble Drilling Co. has the contract to drill the Continental Oil Co. 1 Kinnebrew, in NE NE NW 27-3n-1e, south of Pauls Valley, in Garvin County, Oklahoma. Location was being cleared. Contract is for the McLish.

Tower Drilling Co. has been organized by L. L. Van Zandt and W. J. Blankenship to engage in contract drilling in California fields. Preparations have been started to spud the firm's first well. Headquarters will be maintained at 319 Prospect Avenue, Long Beach, Calif.

Gordon Oil Co. has been awarded drilling contract on the Sinclair-Wyoming Oil Co. 1 Lena C. Newman, in SE SE NE 7-13n-16w, Oceana County, Michigan.

Jackson Drilling Co. has opened an office at 618 Apco Tower, Oklahoma City, with Orville H. Parker and L. C. Crowe assigned to the office.

H. R. Miller is the drilling contractor on the L. E. Bourrett 1 James & Manilla Booher, in NE SE SE 8-14n-14w, Newaygo County, Michigan.

Dyer & Rice is the firm name of a new concern which has been established in Denver, to engage in contract drilling. Two rotary rigs have been purchased and the firm will do development work in addition to contract drilling.

Don T. Ingling has the drilling contract on the Darby & Bothwell, Inc. 1 Richards, in NW NE NW 2-20-16w, Ellis County, Kansas. Gulf Oil Corp. and Continental Oil Co. are supporting this wildcat test.

Baker Drilling Co., Los Angeles, has spudded a new well in the Edison field of California for Des Moines Oil Co. on the Porter property in Section 17-30s-29e.

Robert W. Atha is the contractor on the Gulf Refining Co. 1 Charles Drake, in W½ SW¼ 7-16n-7w, Mecosta County, Michigan.

K. L. Kellogg, California drilling contractor, is running three strings of drilling tools in the Elk Hills field of California for account of the Navy Department. Standard Oil Co. of California is supervising this work at actual cost.

Mercury Drilling Co. has the contract for Sohio Petroleum Co. 2 Messenbaugh, in C SE NW 30-15n-4w, West Edmond field, Oklahoma. This location completes Mercury's six-well contract in West Edmond for Sohio.

Drilling & Exploration Co. has just completed a new well for Lloyd Corp. in the Ventura Avenue field of California at 11,461 ft. This is one of several wells drilled for the same operator at Ventura Avenue, reputed to be one of the hardest fields in which to drill.

Lupher Drilling Co. has contracts to drill three wells for Sohio Petroleum Co. in Isabella County, Michigan. The locations are respectively in Sections 28, 29, and 30, and are the 2 Almon Spencer, the 1 Roy C. Hoffman, and the 1 Oscar Dague.

Appalachian Fields

(Continued from page 110)

after shot at 2,940-50 ft. increased to 678,000 cu. ft.

In Westmoreland County, Peoples Natural Gas Co. completed 2 John Smeltzer with an open flow of 430,000 cu. ft. of gas from a total depth of 3,540 ft.

In West Virginia, the Oriskany test of South Penn Natural Gas Co. on R. P. Ingram farm in Union district, Wood County, appears dry through the Oriskany sand which was hard and tight and void of any showing of oil, gas, or water. The Big Injun sand was logged at 1,571-1,773 ft., Berea at 2,183-91 ft., Corniferous lime at 5,014 ft., Oriskany top at 5,182 ft., and in limy sand at 5,214 ft.

In Wirt County, the deep test of Godfrey L. Cabot, Inc., on Annie B. Smith farm in Elizabeth district is drilling at 5,319 ft. and in the Marcellus shale with the Corniferous lime the next early and important marker.

In Tridelphia district, Logan County, United Producing Co. completed the test, 1,169 Pardee Land Co., after drilling through the Devonian shale at 4,900 ft. which was dry and plugging back to the Weir sand. After shot at 3,145-65 ft., it gaged 340,000 cu. ft. of gas.

In Washington district, Boone County, South Penn Natural Gas Co. completed 90 Yawkey-Freeman as a Big lime gas well gaging 1,391,000 cu. ft. after acidizing the lime which had an initial gage of 179,000 cu. ft. The total depth was 1,492 ft. with the Big lime at 1,248-1,440 ft.

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THE ONE BOLT COUPLING

Replaceable Parts
Minimize Maintenance Expense!

THORNHILL-CRAVER COMPANY
HOUSTON

MARKET QUOTATIONS

Prices as of March 6, 1945

(This service is abbreviated because most refinery products are selling at the Government's price ceilings. Quotations on other products than those shown here furnished on request. Quotations are f.o.b. plant in tank cars and in cents per gallon.)

REFINERY GASOLINE

Octane (A.S.T.M.)	75†	70-74
Mid-Continent*	6.75	5.875
Gulf Coast	6.75	5.625
Northeast Coast	...	6.075
California	...	6.50-7.00

*Basic Oklahoma Group 3. †1939 C.F.R. (research method).

NATURAL GASOLINE

Grades:	28-70	18-55
Oklahoma (Group 3)	4.750	5.700
North Texas (Dist. 1 Del.)	4.500	5.400
North Texas (f.o.b. plant)	4.375	5.250
North Louisiana (Dist. 1 Del.)	5.160	6.080
North Louisiana (f.o.b. plant)	4.375	5.250
California	4.875	5.500

CRUDE-OIL PRICES

Representative posted schedules per bbl.	
East Texas	$1.25
Conroe	1.43
Tepetate, Louisiana	1.18
Illinois basin	1.37
Pecos County, Texas	.95
Bradford, Pennsylvania	3.00
Van, Van Zandt County, Texas	1.08

Note: Exclusive of subsidy.

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated:

Gravity.	Signal Hill, Calif.	Okla-homa Kansas	Gulf Coast Texas	West Texas
18-18.9	$0.89	....	....	....
19-19.9	.84	....	$1.06	$0.70
20-20.9	.88	$0.85	1.08	.72
21-21.9	.92	.87	1.10	.74
22-22.9	.96	.89	1.12	.76
23-23.9	1.00	.91	1.14	.78
24-24.9	1.03	.93	1.16	.80
25-25.9	1.07	.95	1.18	.82
26-26.9	1.11	.97	1.20	.84
27-27.9	1.15	.99	1.22	.86
28-28.9	1.18	1.01	1.24	.88
29-29.9	1.20	1.03	1.26	.90
30-30.9	1.23	1.05	1.28	.92
31-31.9	....	1.07	1.30	.94
32-32.9	....	1.09	1.32	.96
33-33.9	....	1.11	1.34	.98
34-34.9	....	1.13	1.36	1.00
35-35.9	....	1.15	1.38	1.02
36-36.9	....	1.17	1.40	1.04
37-37.9	....	1.19	1.42	1.06
38-38.9	....	1.21	1.44	1.08
39-39.9	....	1.23	1.46	1.10
40 and above	....	1.25	1.48	1.12

*Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT

Week ended February 24, 1945

(Figures in thousands of barrels)

	Dly. crude runs to stills	Stocks *Gasoline	Distillate	Residual
East Coast	698	13,349	5,469	4,926
Appalachian	161	4,250	506	433
Ill., Ind., Ky.	819	22,933	3,741	2,336
Okla., Kan., Mo.	376	9,447	1,743	1,174
Inland Texas	246	3,091	381	656
Tex. Gulf Coast	1,173	15,836	5,418	8,021
La. Gulf Coast	284	5,120	1,859	1,442
North La., Ark.	82	3,057	757	271
Rocky Mountain	110	2,238	330	608
California	854	16,651	8,549	26,856
Total 2-24-45	4,803	95,972	28,753	48,723
Total 2-17-45	4,787	94,680	29,864	48,240
Total 2-26-44	4,421	84,392	33,889	51,879

*Military 45,019; civilian 50,953.

CRUDE-OIL STOCKS

(Bureau of Mines Estimate)

Week ended—	Bbl. of crude*
February 24, 1945	219,351,000
February 17, 1945	220,060,000
February 26, 1944	237,137,000

*Excludes unrefinable California stocks.

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"REFLEX"
WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

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EIGHT interchangeable cutters of heat treated and hard surfaced steel. For drilling through cement, collapsed casings and variable formations and straight holes.

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PERSONALS

Chief Petroleum Engineer for Humble

BOWMAN THOMAS, recently made chief petroleum engineer for Humble Oil & Refining Co., joined that organization as a junior petroleum engineer in 1929 shortly after his graduation from University of Oklahoma. Before that he had worked for various oil operators in the Wichita Falls area as a roustabout and rotary helper. In January 1940 he was made assistant chief petroleum engineer, which position he held until his recent advancement. He succeeds Carl E. Reistle, Jr., who became general superintendent of Humble's production department.

Thomas has been active in the work of American Petroleum Institute, being author of two technical papers on production operations and past chairman of the Houston chapter. He is a member of American Institute of Mining and Metallurgical Engineers, and secretary and treasurer of the Houston Alumnae of Sigma Alpha Epsilon. He was born at Kansas City, and received his early education at Kemper Military School, Boonesville, Mo. He is married and has one child.

Frank H. Stone is now resident engineer at the La Gloria Corp. plant at Falfurrias, Tex. He was formerly with Shamrock Oil & Gas Corp., Amarillo.

Charles R. Bellamy, chief engineer in the gas department of Columbia Gas & Electric Corp. and vice president of Columbia Engineering Corp., has been appointed chairman of the American Gas Association committee on industrial gas research.

Sgt. Robert C. Nitschke, formerly consulting engineer with Engineer Development Co., New York, is now conducting analytical tests on petroleum products at the 941st petroleum products laboratory, in Belgium. Before establishing his own firm Nitschke was affiliated with Standard Oil Co. of New Jersey.

E. C. Reece has been named superintendent of the recently formed Wasson-Hobbs division of Shell Pipe Line Corp.'s Texas-Gulf area. The new division includes operations in Lea County, New Mexico, besides those in the Wasson field. Reece, who joined Shell Pipe Line in 1928, was a district foreman for 4 years, acting division superintendent at Healdton, Okla., for a year, and then a supervisor-counselor in the personnel department.

Ralston M. Dinges, who joined the Petroleum Administration for War in February 1942 as director of materials for District 1, has resigned after 3 years' service. Dinges represented Continental Emsco Co., Inc. in London prior to the war, was bombed out in the blitz of 1940 and returned to New York. In addition to his duties as PAW director of materials, he acted as head of the employes management council of PAW, District 1. He is a member of the New York chapter of Nomads, A.S.M.E., and American Petroleum Institute. After an extended vacation, Dinges will return to Europe.

Louis P. Card, who was head well puller for Shell Oil Co., Inc. in the San Joaquin division, California, has been promoted to production foreman at Bakersfield. **Lee A. Ebaugh,** who was a driller in the San Joaquin division, has been promoted to drilling foreman in the same division.

P. H. (Patsy) Mack, honored as "Pioneer of Pioneers" at the 1940 International Petroleum Exposition in Tulsa, observed his ninety-third birthday in Bradford, Pa., on February 24. At the time of his retirement in 1931 Mack was manager of the Bradford office of Oil Well Supply Co. During his career with that company, which began in 1880, he has obtained patents on 70 inventions of drilling and fishing tools.

Arthur T. Proudfit, formerly vice president and general manager of Creole Petroleum Corp., was elected president last week, succeeding the late C. H. Lieb. He will continue to serve as general manager of the company's Venezuelan operations, with headquarters in Caracas. Virtually all of Proudfit's oil career has been spent in Latin-American countries, and he speaks Spanish like a native. Educated at Oregon Agricultural College, he started as a derrick workman in 1919 for Huesteca Petroleum Co., in Tampico, Mexico, and received steady promotions.

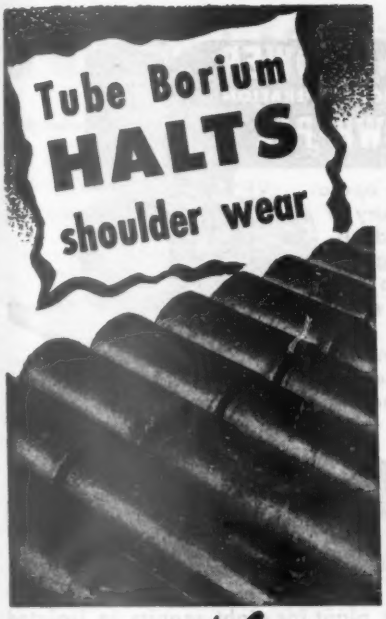
Harold E. McNeil, formerly chief geologist for Great Lakes Carbon Co. in Oklahoma and Kansas, has resigned that post to engage in consultant work in Wichita.

A. C. DeWoody, superintendent of Sun Pipe Line Co., has resigned after 36 years' service, during which he was successively station engineer, gager, scout, foreman, and terminal agent.

F. G. White is the new superintendent in the North Basin area for Magnolia Pipe Line Co., with headquarters in Midland, Tex. He succeeds **S. D. Breedlove,** who resigned to enter the ranching business, but continuing to reside in Midland. Breedlove was honor guest at a banquet given by Magnolia employes.

R. E. Old, Jr., has resigned as manager of the bottom-hole and engineering departments of Core Laboratories, Inc., to become reservoir engineer for Socony-Vacuum Oil Co. of Venezuela. He is stationed at Caracas.

E. W. Lang, formerly supervisor of automotive sales in Boston for Cities



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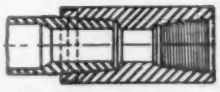
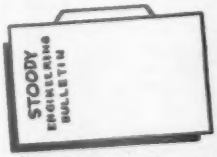
An exceedingly small quantity of Tube Borium welded in a ring around the shoulder not only doubles tool joint life—even under the toughest operating conditions—but maintains over all joint strength and correct elevator contour. Applications are economically made on both new and resleeved joints.

APPLICATION: Accepted method of application is to under-cut new or resleeved joints at the shoulder to form a recess ⅛" deep by 1½" wide. The recess is then filled by welding in with ⅜" Electric Tube Borium to form the wear resistant inlay.





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STOODY HARD-FACING ALLOYS
Retard wear . . . Save Repair

Service Oil Co., has been appointed manager of the Wilkes-Barre, Pa., district. His territory includes Pennsylvania, West Virginia, southern New York, western Maryland, and District of Columbia.

Frank M. Surface, coordinator of sales research for Standard Oil Co. (New Jersey) since 1943, has been made executive assistant to the president. From 1927 to 1933 Surface was assistant director of the bureau of foreign and domestic commerce in the Department of Commerce.

Edward Walker, division manager of Shell Oil Co., Inc., has been elected chairman of the flammable liquids board of Toledo, Ohio, organized in compliance with a city ordinance. **A. E. Blandford,** division superintendent of Gulf Refining Co., was elected secretary. The board will recommend any changes necessary in flammable liquids regulations. Others of the board are **F. J. Bates,** general agent Sinclair Refining Co.; **G. V. Harris,** assistant division manager Standard Oil Co. of Ohio; **Stephen A. McHugh,** district manager Sun Oil Co.

Capt. W. B. Stone, of Fort Worth, who worked in the production department of Gulf Oil Corp., before entering the Army in October 1939, is now serving in the animal transport section of a Y-Force field artillery center in western Yunnan. Captain Stone, who won a letter boxing at John Tarleton Agricultural College, Stephenville, Tex., boxed also for American Athletic Union and Texas Amateur Athletic Federation.

M. L. McGee, manager for Vickers Petroleum Co., Inc. in Oklahoma, has opened offices in Oklahoma City.

CALENDAR

March

American Petroleum Institute, Pacific Coast District, Division of Production, wartime conference, Biltmore Hotel, Los Angeles, March 29.

April

I.P.A.A., midyear directors meeting, New Orleans, La., April 16-18.

June

Canadian Gas Association, annual convention, Manoir Richelieu Hotel, Murray Bay, Quebec, June 19-22.

October

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 4-6.

I.P.A.A., annual membership meeting, convention city to be selected later, October 15, 16 and 17.

ORBIT VALVES

DRILLING VALVES ARE QUICK OPENING

ONLY 2½ to 5 TURNS ARE REQUIRED TO FULLY OPEN OR CLOSE THE ORBIT DRILLING VALVE. THE SEATS ARE PROTECTED AGAINST DAMAGE FROM DRILLING TOOLS AND WIRE LINES.

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SERVICE REPRESENTATIVES
R. G. "Bob" Cole, Houston, Texas
Phone Fairfax 0057
Warehouse 1121 Rothwell, Sect. 15, Houston
Earl F. Warren, Phone 919-W, Alice, Texas
Rex E. Galloup, Phone 6436, Lubbock, Texas

ORBIT VALVE COMPANY
TULSA, OKLAHOMA

Fast, easy pipe cuts with this 4-wheel RIDGID

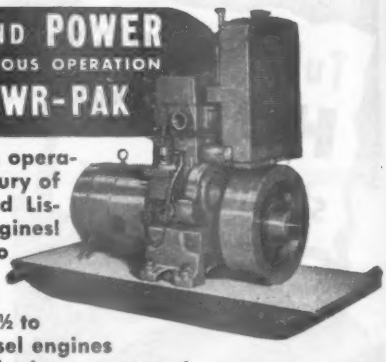
Cuts cleanly with a quarter turn

● In tight places it's a wonder. Short handle — and 4-wheels mean swift clean easy cuts, which you'll enjoy also where there's plenty of room to work. A beautifully balanced husky cutter that doesn't fool around, the stout frame making the special heat-treated steel wheels always cut true. Two sizes: No. 42, ½" to 2"; No. 44, 2½" to 4". Buy it for better cutting and long service — at your Supply House.

Regular RIDGID *Cutter has fast cutting thin-blade wheels.*

RIDGID
WORK-SAVER PIPE TOOLS
THE RIDGE TOOL COMPANY · ELYRIA, OHIO, U. S. A.

LIGHT AND POWER
FOR CONTINUOUS OPERATION
DIESEL-ELECTRIC **POWR-PAK**



Low cost, reliable operation—over a century of experience behind Lister-Blackstone engines! Compact, ready to be put to work... lighting drilling rigs, etc.—sizes, 3½ to 10 kw. Also Diesel engines for powering gathering pumps and small well pumps — 8 and 16 h. p.

Auxiliary units also available.

LIGHT AND POWER
FOR NIGHT REPAIRS
THE NITE-HAWK

Portable, engine-driven power plant for night repairs in isolated areas. Four 80,000 candle power floodlights, adjustable up and down and in all directions! Also, power to operate electric hand tools!

Powr-Paks and Nite-Hawks are available through oil field supply stores everywhere. Literature on request.

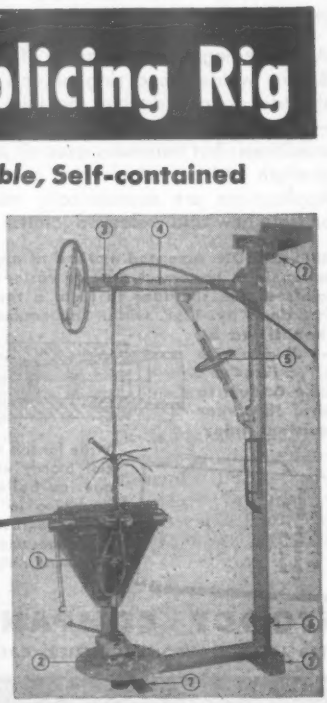
NITE HAWK

LISTER-BLACKSTONE, Inc.
1706 SOUTH 68th ST. • MILWAUKEE 14, WISCONSIN

GAR-BRO Splicing Rig

Easily *Portable*, Self-contained

The Gar-Bro Cable Splicing Rig takes care of all the necessary operations in the splicing of a cable. Any standard splicing vise (1) can be attached to the revolving stand (2), permitting the twisting of the cable by revolving the splicing vise. An overhead quick opening type gripping vise (3) is provided, mounted on a pivoted tension arm (4) with tension adjustment wheel (5). This Splicing Rig replaces overhead chain block, grip chains and twisting bar, as commonly used, and is much faster and easier to operate. The Gar-Bro Cable Splicing Rig can be set up, lashed to a tree or post, and be working in 10 minutes. On shipboard, it may be mounted on benches for horizontal splicing. Overall size, 96"x45". Weight, without vise, 250 lbs., approx. Top and bottom members are readily detached. No section of the unit weighs over 100 lbs. Write for Bulletin No. 73.



GAR·BRO GARLINGHOUSE BROTHERS
MANUFACTURERS
2416 E. 16th St. • Los Angeles 21, California

Equipment Men in the News

New Vice President for National Foam System

Hart H. Fleming, a director of National Foam System, Inc., Philadelphia, Pa., for 15 years, has assumed the vice presidency of the company which during the war is producing highly specialized chemicals and apparatus for extinguishing fires aboard American combat vessels, and in peacetime supplies equipment and foam to extinguish petroleum and chemical plant fires and to protect airport installations and aircraft. He also continues as a director.

Fleming is continuing as vice president and a director of Johnston & Jennings, Cleveland, Ohio, and holds similar positions with Southern Detinning Co., Birmingham, Ala.

Plant Rubber Announces Two Changes

Plant Rubber & Asbestos Works announces the appointment of J. C. Voiles as chief engineer with headquarters at San Francisco main office. Voiles will be succeeded by R. E. Bounds as manager, industrial construction department for Los Angeles district.

Urquhart Heads Wilmington Chemical

Wilmington Chemical Corp., 10 East Fortieth Street, New York, N. Y., announces that G. Gordon Urquhart has been named president, formerly vice president of the National Foam System, Inc., succeeding Herbert Waller, who recently resigned.

Henrik J. Krebs, who has been actively associated with the firm as secretary and a director, becomes treasurer to succeed A. D. Bestebreurtje, also resigned. Both Waller and Bestebreurtje remain as directors of the company.

Bank Establishes Oil and Gas Division; Engages Engineer

The City National Bank of Houston, Houston, Tex., announces establishment of an oil and gas department.

In order to insure the proper servicing of the oil business which may come into the bank, that institution has acquired the services of George L. Nye, petroleum engineer. Prior to this connection, Nye, a native Oklahoman, was connected with Tide Water Associated Oil Co. in the capacity of chief petroleum engineer and assistant superintendent of production operations in the Mid-Continent area.

South Chester Tube Co. Opens Philadelphia Office

South Chester Tube Co., Chester, Pa., has opened a Philadelphia office at 1418 South Penn Square, with the following personnel: Ralph Earle, vice president, South Chester Corp., subsidiary of South Chester Tube Co.; Francis H. Gibson, general manager of sales, and Clyde M. Abel, purchasing agent.

A director of the Tube company, Earle is also vice president of South Chester Corp., a subsidiary organized to handle business which may not be an integral part of the Tube company or of its other subsidiary, Chester Tidewater Terminal.

Francis H. Gibson has served as general manager of sales for several years, with offices at the Chester plant. Clyde M. Abel was formerly assistant purchasing agent.

Coincident with the opening of the Philadelphia office, C. H. Roberts has been appointed manager of orders, and R. E. Wallace has been appointed assistant general manager of sales, with offices at the Chester plant.

Tulsa Nomads Elect Officers

SHEP MIERS

Shep Miers, vice president, Southwest Supply Co., Tulsa, has been elected president of the Tulsa Chapter Nomads, succeeding Jack Walton, of Clark Brothers Co., Inc. Other officers elected with Miers are: Don Hinderliter, Hinderliter Tool Co., vice president; H. M. Cooley, Bethlehem Steel Co., secretary-treasurer; H. G. Texter, Spang-Chalfant, Inc., sergeant at arms, and regents, D. S. Bowers, W. C. Norris Manufacturer, Inc., and H. M. Cosgrove, Purchasing Agents Association of Tulsa.

Sennet Succeeds Sybrandt as Chicago Representative

LOWELL E. SENNET

John L. Sybrandt, for many years manager of the Chicago office of The Ludlow Valve Manufacturing Co., Inc., has retired. His position is to be filled by Lowell E. Sennet, an engineer with long and thorough experience in valve applications. Sennet was graduated from Case School of Applied Science and has previously been with the engineering departments of the Grinnell and Crane companies.

Los Angeles Nomads Elect Officers for 1945

Shown here are the new officers of the Los Angeles chapter of Nomads, who were recently elected. Front row: Roland E. Smith, export representative, regent; Elmer R. Smith, export representative, president; Henry W. Pullman, Baker Oil Tools, Inc., regent. Back row: Custer Morrow, Lummus Co., deputy sergeant at arms; J. V. Robinson, Miller-Robinson Co., secretary; C. M. Byron, Baker Oil Tools, Inc., assistant secretary; Waldo G. Moore, Cavins Co., assistant treasurer; H. E. Cassidy, McCarty Co., sergeant at arms; Fred Tyler, Reed Roller Bit Co., treasurer, and William McGraw, Western Pipe & Steel Co., vice president

Bell Heads A. O. Smith Board of Directors

Rae F. Bell, former first vice president of A. O. Smith Corp., has been elected chairman of the board of directors to succeed the late L. R. Smith.

Bell started with the corporation in 1923 as a vice president, and in 1937 was elected first vice president. He became a board member in 1925.

Anthony von Wening, formerly a vice president of the Continental Illinois National Bank & Trust Co., of Chicago, who joined the A. O. Smith Corp. in 1940, was elected vice president and controller. Other officers were reelected.

Monsanto Promotes Semple

Monsanto Chemical Co.'s organic chemicals division has announced the promotion of R. B. Semple, to manager, petroleum chemicals sales. Semple, formerly associate director of development, succeeded Arnold H. Smith, now assistant director of the company's foreign department.

Classified Advertising

HELP WANTED

ENGINEERS WANTED: Graduate Ch.E., M.E., or E.E., 20 to 29 years of age, having refinery or laboratory experience. Essential industry with post-war continuance. State education, experience, salary expected, and date of availability. P. O. Box 2546. Houston 1, Texas.

HELP WANTED: Engineer experience in selection automatic controls petroleum refining units and in field installation of same. Foster Wheeler Corporation, Petroleum Refiner Division, 165 Broadway, New York.

DRAFTSMEN

For Process Piping on
Oil Refineries

Applications solicited from men not now employed in essential work or those completing essential work who have Statements of Availability

ARTHUR G. McKEE & CO
2300 Chester Avenue
Cleveland, Ohio

HELP WANTED

Construction superintendent with general field experience in supervising and organizing large petroleum refinery or equivalent project. Write references, salary. Foster Wheeler Corporation, Construction Department, Carteret, New Jersey.

WANTED: EXPERIENCED REFINERY SUPERINTENDENT for Gulf Coast refinery. Preferably chemical engineering background with Dubbs or Kellogg cracking plant experience. In application state age, experience, education, training, salary expected, when available. Statement of availability required. All replies confidential. Box A-426, The Oil and Gas Journal, Tulsa, Oklahoma.

ONE OF the foremost producers of Industrial Wiping Cloths, both reclaimed and new materials, also mill ends, remnants, etc., is interested in assigning territory now to be ready for post-war operation. We are interested in the better type sales representative organizations now calling on the Industrial Trade. Advise particulars on manpower, territory and lines now carried. All replies will be treated confidentially. Box A-428, The Oil and Gas Journal, Tulsa, Oklahoma.

Ashland Oil & Refining Company,
Ashland, Kentucky
WANTS
DESIGNING DRAFTSMAN

With experience in oil refinery and power plant piping, pressure vessels and heat exchangers. Independent company with completely integrated operations and a large output of 100 octane gasoline. Due to postwar program this position offers excellent opportunities for the future.

Address all correspondence to Employment Department. Applicants must comply with War Manpower Commission Regulations.

HELP WANTED

WANTED: By Inland Texas Refinery. Shift Foreman for Combination Dubbs Cracking and Skimming Plant manufacturing asphalts, cracked gasoline and side-cut naphthas. Permanent job for right man. Box A-447, The Oil and Gas Journal, Tulsa, Okla.

WANTED: Engineers and Chemists, by a Petroleum Research and Development Organization in Oklahoma doing research, refinery process service and production work. Experience desirable but not required. Engineers with degrees in chemical, petroleum production or civil engineering considered. Women chemists given equal opportunity with men. State in first letter salary expected, draft status, date available, furnish education and experience record. War Manpower Commission compliance required. Box A-455, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED
MECHANICAL AND ELECTRICAL ENGINEER. Oilfield Equipment Manufacturer of International prominence located in Beaumont, Texas, desires to employ qualified Mechanical or Electrical Engineer to assist in the design of D.C. Electric Drilling Rigs. Good Salary, with unlimited post-war possibilities. All answers strictly confidential. Reply Box A-437, The Oil and Gas Journal, Tulsa, Okla.

CHEMISTS—ENGINEERS
PHYSICISTS

Men interested in careers in industrial research are urged to write us giving details of training and experience. Essential work with promising postwar future offering opportunities for professional growth.

BATTELLE MEMORIAL INSTITUTE
COLUMBUS 1, OHIO

MEN FOR FOREIGN EMPLOYMENT
in Saudi Arabia

Refinery operators; petroleum, electrical and mechanical engineers; radio operators and technicians; Diesel and tractor mechanics; air-conditioning and refrigeration mechanics; stabilizer operators; utility operators; surveyors; boilermakers, pipefitters, and various other crafts; accountants; stenographers; typists.

Employment offers opportunities for post-war security and advancement. Liberal benefit plans; vacations in United States; free hospital and medical care.

If genuinely interested in foreign career, send full information on experience, transcript of college record (professional applicants only), references, draft and availability status to our Employee Relations Department.

ARABIAN AMERICAN OIL COMPANY
200 Bush Street
San Francisco 4, California

DESIGN & PRODUCTION ENGINEER

for company operating complete electric steel foundry, bronze, brass & aluminum foundry, and fully equipped machine shop. Production of standard steel valves & fittings now used 100% war effort will continue uninterrupted through postwar period. Development of products to complete valve line and for petroleum refining & drilling industry for full postwar production in progress.

Forward Personal Experience Record Past Ten Years

SOLLBERGER ENGINEERING COMPANY
Box 1188
Marshall, Texas

HELP WANTED

WANTED by consulting organization: Petroleum engineers with Hayward mud logging experience or its equivalent. Immediate openings in Venezuela, excellent opportunity for advancement to managerial positions throughout the world. Box A-298, The Oil and Gas Journal, Tulsa, Okla.

PURCHASING

Outstanding opportunity for a man to advance in Purchasing Department of a $20,000,000 corporation now preparing post-war expansion program. Character, intelligence, and initiative more important than experience, although engineering training and knowledge of construction materials will be helpful. Give full details in reply to

Box A-464
The Oil and Gas Journal
Tulsa, Oklahoma

SITUATIONS WANTED

PRODUCTION Superintendent, 47, now employed with over twenty years field experience — production, drilling and workovers, an engineering graduate, sober, industrious and capable, desires affiliation with Mid-Continent concern where he can be kept busy. Box A-448, The Oil and Gas Journal, Tulsa, Oklahoma.

EXPERIENCED LANDMAN, ex-service man, wants permanent connection with substantial oil company or independent operator. Address Box A-187, The Oil and Gas Journal, Tulsa, Okla.

GEOLOGIST AND LANDMAN: Has B.S. Degree; subsurface and lease experience in central United States, Rocky Mountain Area and Appalachian Region. Desires position in domestic or foreign work. Available now. Box No. A-450, The Oil and Gas Journal, Tulsa, Oklahoma.

ACCOUNTANT, oil drilling, refining and production experience. Some public accounting experience. Box A-451, The Oil and Gas Journal, Tulsa, Oklahoma.

CHEMICAL Engineer: Several years Refining and Recycling Plant experience as Process Engineer. Also experimental and research laboratory work. Plant design, operations, super fractionation, alkylation, fluid catalytic cracking. Box A-443, The Oil and Gas Journal, Tulsa, Oklahoma.

HIGH-CLASS Man, Age 47, married, no children, two years college, desires permanent position with progressive independent. Presently employed as Office Manager-Auditor large Texas producer—Salary $350. Betterment only reason for change. Box A-441, The Oil and Gas Journal, Tulsa, Oklahoma.

16 YEARS experience on topping, combination, coking, reforming and fluid catalytic cracking. Prefer position in mid-west or west. Can furnish statement of availability. Box A-446, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: Twelve years laboratory and field experience in all phases seismic prospecting, from technician to party chief. Age 37, draft deferred. B.S. degree in electrical engineering. M.S. in physics. B.A. in geology. Interested in employment in geophysical or production departments, not requiring continuous change of residence. Box A-453, The Oil and Gas Journal, Tulsa, Oklahoma.

EQUIPMENT WANTED

WANTED
2½ INCH PIPE
Also other sizes of pipe and tubes.
Write, wire or phone
SONKEN-GALAMBA CORP.
Kansas City 18, Kansas.

Wanted
TANK CAR TANKS

Can use up to 10. Give capacity, lowest price and location. Also need 6—12000 to 15000 gal. Regular Tanks.

THE W. H. DYER COMPANY
Fullerton Bldg. St. Louis 1, Mo.